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BIRD-BANDING

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VOL. V. JANUARY, 1934 No. 1

THE MIGRATORY MOVEMENTS OF CERTAIN COLONIES OF HERRING GULLS IN EASTERN NORTH AMERICA

By RICHARD JEFFERSON EATON

PART II[1]

THE MUSKEGET ISLAND (MASSACHUSETTS) COLONY

BANDING work on this colony has been done chiefly by Miss Grace C. Meleney, to whom I am particularly indebted for the use of her records. Mr. John A. Gillespie, Mr. L. B. Fletcher, and others have contributed to a greater or less degree. The number of recoveries is not sufficiently large to justify a detailed analysis by map and diagram. As a substitute the following table of recoveries has been arranged in the order of age as of the date when first reported. For convenience, all gulls are assumed to be hatched on July 1st, thus becoming a year old on the following June 30th. It is suggested that the reader refer to the map and diagram on pages 171 and 173 of this journal (Vol. IV, No. 4) and then attempt to visualize the migration curve of the Muskeget colony.

DETAILED RECORD OF RECOVERIES FROM THE MUSKEGET ISLAND COLONY
(Arranged in chronological order of age)

Date of Banding	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gull Recovered*
7/13/32	A703294	Bethany Beach, Del.	9/13/32	FD	1st year
"	B621854	Shippigan, Gloucester Co., N.B.	9/13/32 (Hurricane?)	FD	" "
"	B621823	West Chop, Mass.	9/15/32 (Hurricane?)	FD	" "
7/13/30	A703219	Rappahannock Spit, Chesapeake Bay	10/ 4/30	FD	" "

[1] The writer is greatly indebted to Mr. Richard M. Hinchman, of Harvard University, for his assistance in the accumulation of data and for the preparation of some of the figures in this and subsequent installments of this paper.

7/16/28	408596	Babylon, L. I.	10/ 7/28	FD	" "
7/13/30	303200	Gray, Jones Co., Ga.	10/ 8/30	Shot	" "
"	303180	Lutcher, La.	11/11/30	Shot	" "
"	A703214	Southampton, L. I.	11/13/30	K	" "
7/13/32	B621861	Eastchester, N. Y.	11/22/32	FD	" "
7/13/30	A600725	Jacksonville, Fla.	12/17/30	K	" "
"	A709743	Arroyo Colorado, Rio Grande Valley, Cameron Co., Tex.	1/ 1/31	FD	" "
7/13/32	B621877	Galveston, Tex.	1/16/33	C	" "
6/18/30	386813	Point au Fer, La.	1/26/31	Trap	" "
7/13/32	B621837	Coronado Beach, Fla.	1/27/33	Shot	" "
"	B621844	Vermillion Parish, La.	2/ 8/33	FD	" "
7/13/30	A709727	Vera Cruz, Mexico	3/ 1/31	FD(?)	" "
8/ 5/32	B621886	Aransas Pass, Tex.	4/21/33	C	" "
7/13/30	A600748	Sabine, Tex.	4/ 4/32	Shot	2d year
6/18/30	386716	Staten Island, N. Y.	5/15/32	C	" "
7/ 9/25	387020	Woods Hole, Mass.	8/ 7/26	C	" "
7/16/28	408658	East Dennis, Mass.	11/20/30	FD	3d year
7/ 9/25	387014	Nantucket Sound, Mass.	1/ 2/30	FD	5th year

References: C—Caught, FD—Found Dead, K—Killed.

An inspection of this table reveals an obvious similarity to the Essex County colony. Judging from twenty-two recoveries (and except for an elaboration of detail, this number must be considered significant), the young Muskeget gulls of the season are well on their way south by early October, reach the Gulf in November, and appear to concentrate along the coast of Texas in mid-winter. Except for an anomalous recovery of A600748 at Sabine, Texas, on April 4th of the second winter, there is no evidence of any important southward migration of gulls in their second winter. We must wait for further data before learning whether the Muskeget colony will display the second-year autumnal drift to the Carolinas which seems to be characteristic of the Essex County colony.

In referring to A600748 as an anomalous recovery, it is a striking fact that this is the first and only instance thus far noticed of a recovery from the Gulf Coast of a second-year Herring Gull hailing from any New England rookery. Correspondence with the man who reported the recovery has verified the fact that this bird was shot. Although it may have been prevented by an injury (later healed) from participating in first spring migration, we must consider it as a very unusual occurrence.

Another recovery, B621854, deserves comment. This bird was found dead at Shippigan, Gloucester County, N. B., on September 13th of the first year. Although a late-summer northward scattering of immature gulls occurs among some North Atlantic colonies, such a habit is not characteristic of the Essex County colony. Unless we discard the tentative hypothesis that the Muskeget colony is derived from the same population and is endowed with the same migratory traits, we are forced to conclude either that the Essex County record

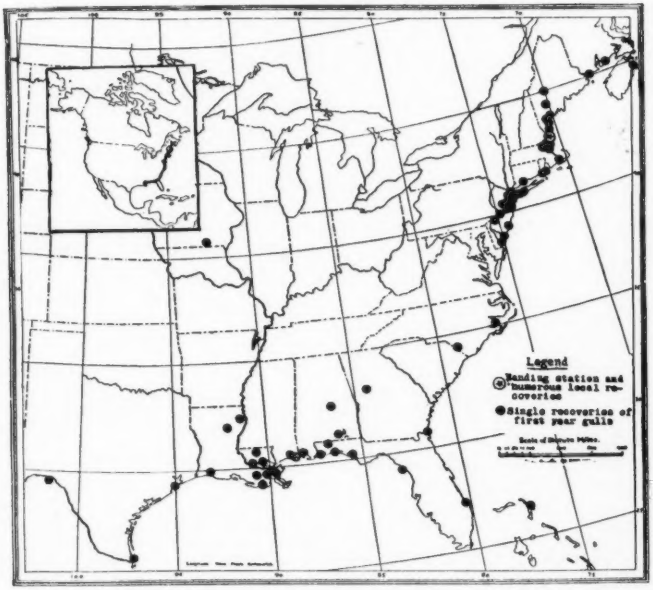


Figure 3. Map showing the distribution of recoveries from the Isles of Shoals colony. Insert: The "migration characteristic" of first-year birds from the same colony.

thus far is very misleading or else that the Shippigan recovery is a mere accident. Some color is lent to this latter alternative by the fact that Miss Meleney's report bore the notation, "Probably killed by the hurricane last week."

The recovery of A709727 at Vera Cruz on March 1st of the first year is noteworthy for holding the record of farthest south in so far as this particular investigation is concerned.

In general, the migratory traits of the Muskeget colony appear identical with those of the Essex County colony.

THE ISLES OF SHOALS COLONY

Through the courtesy of Mr. J. P. Melzer, of Milford, New Hampshire, and his friend, Mr. Lewis O. Shelley, of East Westmoreland, New Hampshire, the results of their extensive banding operations during the four-year period 1929–1932 at

Duck Island, Isles of Shoals, New Hampshire, have been placed at my disposal for publication. The accompanying list of recoveries contains all available data, excluding the records of local juveniles of the year found near the banding station prior to September 1st. Unfortunately the Bureau of Biological Survey on account of lack of funds is unable to furnish an up-to-date list of recoveries from this station, a circumstance which accounts for the relative paucity of data for second-, third-, and fourth-year birds. From a total of about two thousand banded Herring Gulls nearly one hundred recoveries have been reported up to July 1, 1933, of which eighty-four are considered here. The recoveries of local juveniles less than two months old have been disregarded.

Such a large accumulation of data is peculiarly adapted to the analytical treatment employed in Part I of this paper. On the map (Figure 3) is spotted the approximate location of each place of recovery. Apart from the general region of the banding station, two curious centers of concentration are evident: one on the Long Island-New Jersey coast, and a second, more widely dispersed, on the Gulf Coast from western Florida to the Mississippi delta. It is difficult to believe that these centers are purely fortuitous. Possibly they merely reflect a concentration of *human* activity in these particular areas. If this interpretation is correct, we should expect to find a similar effect indicated on page 171, Figure 1, in respect to recoveries from the Essex County colony. Such is not entirely the fact. The latter shows a grouping in the New Jersey region, to be sure, but only a mere scattering from Louisiana eastward. Instead, a marked concentration centers in the Galveston-San Antonio region. Apparently this rather bears out the theory that birds of a feather *do* flock together. In fact, it is not unreasonable to suppose that the same instinct which induces gulls to nest in colonies and to return year after year to the same small islands to breed might require first-year immatures to migrate in colonies and to select well-defined areas for their winter range. Under this supposition we should expect a thin and uniform distribution of recoveries along the migration route and a dense concentration in the winter range. How, then, may we account for the secondary concentration noted in northern New Jersey? If we attribute this to a winter hold-over of relatively weak or unambitious birds attracted by a presumed abundance of food near the middens of a huge city, we should expect (contrary to the fact) to find a midwinter concentration to appear on the graph (Figure 2) in respect to the Essex County colony. Perhaps a more

reasonable explanation is that the Duck Island colony is derived from two different strains and is endowed with a mixed migratory instinct. The force of this suggestion will become more apparent subsequently.

Another point of interest which this map brings out is the tendency of first-year birds from Duck Island to wander northward in the late summer before the fall migration sets in. There is one recovery from Nova Scotia, and there are two from New Brunswick, and four from Maine at places distant fifty miles or more from the banding station. It will be recalled that no such thing has yet been observed in the Essex County colony.

The final difference to be noticed is the relatively wider dispersal of the Duck Island gulls during their migration to places as widely separated as Ketch Harbor, Nova Scotia (A602497), Centerville, Iowa (A684309), Coahuila, Mexico (B610514), and Hopetown, Bahamas, B. W. I. (B676483). Such records may be entirely accidental and of no significance. On the other hand, they may represent extreme limits of range which are not characteristic of the Essex County colony.

The Centerville, Iowa, bird, A684309, killed on October 25th of the first year, well illustrates the significance of detailed analytical investigation of migratory traits of individual colonies. Herring Gulls in all plumages are of common occurrence in the Mississippi River Valley from Minnesota to the Gulf. Ordinarily, a recovery from eastern Iowa would be of no interest whatsoever. And yet we are in a position to say that this particular recovery is well-nigh accidental, for the simple reason that our map shows Iowa to be one thousand miles west of the normal summer range and migration route for the Isles of Shoals colony and five hundred miles north of its normal winter range. Possibly this bird was blown over the Alleghenies during an easterly gale and followed down the Ohio River and thence up the Mississippi; possibly it flew up the river from New Orleans, a most extraordinary feat to accomplish as early as October 25th; possibly the number on the band was misread (a source of error not to be overlooked).

Turning to the graph (page 7, Figure 4) we notice a general similarity between the Essex County and Isles of Shoals colonies, at least in respect to first-year birds. Because of the unfortunate lack of adequate data for second- and third-year birds from the latter colony, particularly during the winter months, we are still ignorant of the movements of its adolescents. A detailed examination reveals certain important differences between the two colonies, the most obvious of

which is the pronounced northward drift toward the end of the first summer. A hint of what the second-year birds may do is revealed by B610893 recovered on September 30, 1932, at West St. John Harbor, N. B., two hundred and twenty-five miles northeast of the banding station. It is one out of a total of six second-year recoveries here recorded. There is no evidence as yet of any such northward drift from the Essex County colony.

Two other important differences are noted: first, the concentration of recoveries in the neighborhood of two hundred and fifty miles south on both sides of the December 1st ordinate, and, second, the more scattered concentration in the region of New Orleans between November 15th and February 1st. These peculiarities have already been discussed. The graph, however, tends to confirm the suspicion that the Long Island-New Jersey region is a secondary *winter* range for the first-year birds from the Isles of Shoals colony. Coupled with the pronounced northward drift, this observation gives added force to the suggestion that we are now dealing with a mixed colony derived from "northern" and "southern" populations.

A detailed discussion of other features of the graph is omitted for lack of space. The reader by inspection may discover the significant dates of arrival and departure, and such other migration data as may reasonably be inferred, in a manner similar to that previously explained (see pages 165–176. 1933).

DETAILED RECORD OF RECOVERIES FROM THE ISLES OF SHOALS, NEW HAMPSHIRE, COLONY OF JUVENILE HERRING GULLS BANDED BY J. P. MELZER AT DUCK ISLAND

Date of Banding	*Band No.*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gull Recovered*
7/ 7/29	A635164	Newport, R. I.	9/ /29	FD	1st year
"	A635058	Huckleberry Island, New Rochelle, N. Y.	11/11/31	I	3d "
"	A635029	Casco Bay, Me.	3/ /32	FD	" "
7/11/30	A676091	Plum Island, Mass.	8/27/30	I	1st "
"	A676201	Hampton Beach, N. H.	8/30/30	FD	" "
"	A676108	Ram Island, Saco River, Me.	9/10/30	FD	" "
"	A676254	Montgomery, Ala.	11/15/30	...	" "
"	A676063	New Orleans, La.	11/16/30	I	" "
"	A676111	Hacoda, Ala. (Geneva Co.)	11/20/30	K	" "
"	A676256	LaSalle Parish, La.	11/20/30	C	" "
"	A676242	Ocean Springs, Miss.	11/22/30	K	" "
"	A676075	Bay Head, N. J.	12/14/30	FD	" "
7/12/30	A602497	Ketch Harbor, N. S.	10/ 1/30	F	" "
7/13/30	A676556	Scituate, Mass.	9/19/30	FD	" "
"	A676431	Lewes Beach, Del.	12/ 4/30	FD	" "
"	A676544	Corpus Christi, Texas	12/ 9/30	C	" "
"	A676597	Everett, Mass.	1/ 1/31	F	" "
"	A676492	Campobello, N. B.	8/31/31	FD	2d "
"	A676407	Port Washington, N. Y. (Nassau Co.)	9/ 3/32	S	3d "

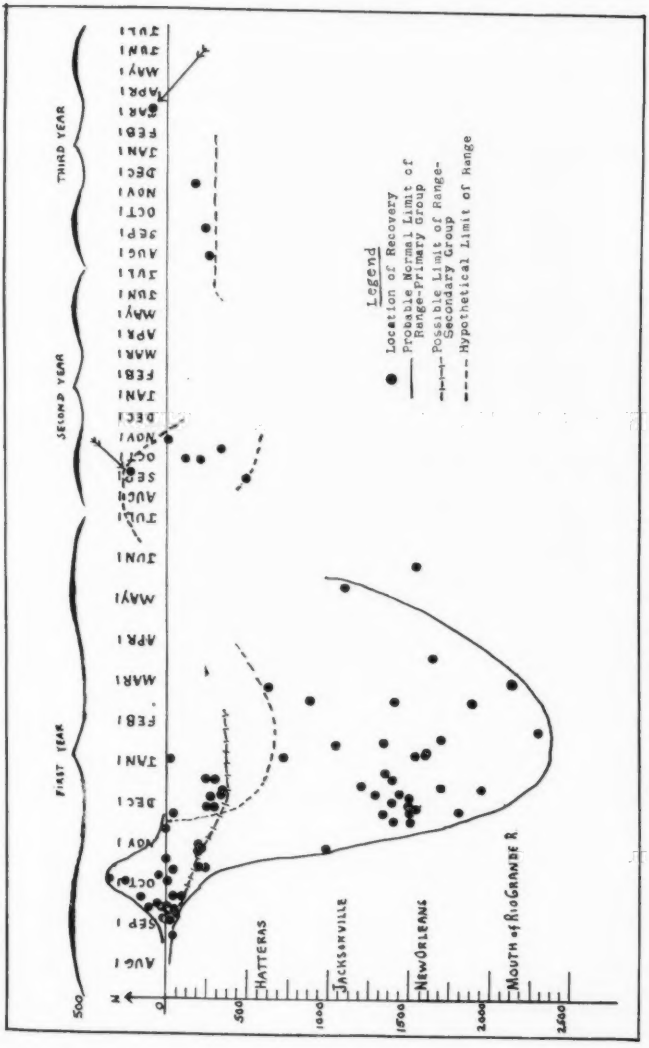


Figure 4. Graph of recoveries from the Isles of Shoals colony.

Date of Banding	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gull Recovered*
6/22/31	B618814	Rye Beach, N. H.	11/ 7/31	...	1st year
6/26/31	A680494	Choctawhatchee Bay, Fla. (Walton Co.)	11/30/31	...	" "
"	A680288	Stone Harbor, N. J. (Cape May Co.)	12/ 4/31	...	" "
"	A680486	Cameron Parish, La.	1/16/32	...	" "
7/10/31	A684347	Woburn, Mass.	8/19/31	K	" "
"	B610209	Androscoggin L., Leeds, Me.	9/10/31	FD	" "
"	B610240	Hampton, N. H.	9/30/31	FD	" "
"	B610054	Cape Elizabeth, Me.	10/ 3/31	FD	" "
"	B610252	Boston Harbor, Mass.	10/ 7/31	FD	" "
"	A684361	Rye Beach, N. H.	10/15/31	FD	" "
"	B610227	Barnstable, Mass.	10/21/31	FD	" "
"	A684343	Bridgeport, Conn.	10/22/31	I	" "
"	A684309	Centerville, Iowa	10/25/31	K	" "
"	A684364	St. Helena Parish, La.	11/25/31	K	" "
"	B610141	Fort Pierce, Fla.	12/ 5/31	FD	" "
"	B610358	Union Lake, Fla. (Walton Co.?)	12/ 5/31	K	" "
"	B610106	Crown Point, La. (Jefferson Co.)	12/10/31	C	" "
"	B610321	Sandy Hook, N. J.	12/15/31	FD	" "
"	B610006	Mobile, Ala., Dry Docks	12/19/31	C	" "
"	B610251	Purvis, N. C. (Robeson Co.)	1/ 1/32	K	" "
"	B610039	New Orleans, La.	1/ 4/32	FD	" "
"	B610154	St. Andrews, Fla.	1/12/32	FD	" "
"	B610234	Pontchartrain Bayou, La.	1/16/32	C	" "
"	B610342	Yonges Island, S. C.	2/12/32	K	" "
"	B610067	Lowland, N. C. (Pamlico Co.)	2/22/32	C	" "
"	B610346	Dulac, La.	3/16/32	FD	" "
"	B610377	Thomaston, Ga.	5/ 7/32	I	" "
"	B610273	Rodman's Neck, N. Y. (Jefferson Co.?)	5/29/32	FD	" "
"	B610171	Point Judith, R. I.	10/ 5/32	FD	2d "
"	B610177	Rockaway Beach, L. I., N. Y.	10/ 5/32	FD	" "
"	B610169	Brigantine, N. J.	10/16/32	...	" "
"	B610162	Rockport, Mass.	10/25/32	...	" "
"	B610058	Rye, N. Y.	7/24/33	FD	3d "
7/18/32	B610453	Plum Island, Mass.	8/30/32	FD	1st "
"	B610837	Kittery Point, Me.	9/ 1/32	FD	" "
"	B610645	Winthrop, Mass.	9/ /32	...	" "
"	B610856	Deer Island, Boston, Mass.	9/ 5/32	FD	" "
"	B610558	Salisbury, Mass.	9/ 8/32	FD	" "
"	B610541	Wallis Sands, N. H.	9/ 9/32	FD	" "
"	B610787	Lake Sebasticook, Me.	9/17/32	FD	" "
7/18/32	B610893	West St. (John?) Harbor, N. B.	9/30/32	...	1st year
"	B610940	Jones Beach, N. Y.	10/ 9/32	FD	" "
"	B610904	Wantagh, N. Y. (Nassau Co.)	10/23/32	...	" "
"	B610816	Lynn, Mass.	11/18/32	FD[1]	" "
"	B610862	Port Mammouth, N. J. (Monmouth?)	11/24/32	...	" "
"	B610894	Trenton, N. J.	11/24/32	...	" "
"	B610714	Pascagoula, Miss.	12/ 2/32	...	" "
"	B610844	Woodbury, N. J.	12/16/32	...	" "
"	B610550	Montegut, La. (Terrebonne Co.)	1/ 3/33	...	" "
"	B610514	Coahuila, Mexico	1/22/33	...	" "
"	B610905	Pensacola, Fla.	2/14/33	FD	" "
"	B610808	Fort Slocum, N. Y.	5/22/33	FD	" "
"	B610412	Gonzales, La. (Ascension Co.)	5/25/33	K	" "
"	B610781	City Island, New York City	6/17/33	C	" "
"	B610868	Seaford, Va.	8/23/33	I	2d "

[1] "Not shot or marked in any way—probably could not stand storm that we had about one week ago."

(THE FOLLOWING WERE BANDED BY MR. LEWIS O. SHELLEY)

7/18/32	B675994	Portland, Me.	9/12/32	I	1st year
"	B675928	Rye, N. Y.	9/26/32	S	" "
"	B676483	Hopetown, Abaco Island, Bahamas, B. W. I.	11/28/32	I	" "
"	B675965	New Brunswick, N. J.	12/ 4/32	FD	" "
"	B676454	Cedar Key, Fla.	12/10/32	K	" "
"	B675951	Ozark, Ala.	12/20/32	C	" "
"	B676436	Newellton, La.	12/26/32	K	" "
"	B676490	Cumberland Bar, near St. Mary's, Camden Co., Ga.	1/12/33	C	" "
"	B675996	Galveston, Texas	2/13/33	FD	" "
"	B676481	12 miles north of Port Isabel, Texas (Cameron Co.)	2/27/33	FD	" "

References: C—Caught; FD—Found dead; I—Injured; K—Killed; S—Sick.

BIDDEFORD POOL (MAINE), COLONY

The colony of Herring Gulls at Gooseberry Island, Biddeford Pool, is about ninety miles north of the Isles of Shoals. Excluding local juveniles, Mr. J. P. Melzer has supplied fifteen recovery records from this station, obtained from banding work done in 1928, 1929, and 1930. The geographical distribution of these recoveries is shown in Figure 5. The following list tabulates them in the order of age as determined by the recovery dates.

Date of Banding	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gull Recovered*	*Distance from Banding Station*
7/17/28	704519	Ocean City, N. J.	9/18/28	K	1st year	400-S
7/17/29	A608593	Erma, N. J.	9/24/29	K	" "	425-S
7/12/30	A676336	Tiverton, R. I.	12/12/30	FD	" "	150-S
7/17/29	A608537	Daughin Island, Ala.	1/13/30	K	" "	1550-S
"	A608520	Bay Harbor, Fla.	1/20/30	FD	" "	1400-S
"	A608501	Mayport, Fla.	1/27/30	FD	" "	1150-S
7/17/28	704520	Cedar Keys, Fla.	2/ 6/29	K	" "	1275-S
7/12/30	A676492	Campobello, N. B.	8/31/31	FD	2d "	200-N
7/17/28	704502	Long Beach, L. I.	10/ 9/29	FD	" "	250-S
7/17/29	A608589	Bronx, N. Y.	1/24/31	FD	" "	250-S
7/12/30	A676378	Barnegat Bay, N. J	1/24/32	FD	" "	300-S
7/17/29	A608595	Mouth, Savannah River, Ga.	3/29/31	FD	" "	1000-S
"	A608510	Reedy Pt. Bridge, Del.	11/18/31	FD	3d "	400-S
"	A608557	Baldwin Harbor, Long Island, N. Y.	3/20/32	FD	" "	250-S
7/17/28	704544	Beverly, Mass.	5/14/33	FD	5th "	75-S

Figures in miles. N—north, S—south.

It requires no great effort of the imagination to reconstruct the probable migration curve of this colony. By mid-September the first winter flight is under way, as shown by New Jersey recoveries on September 18th and 24th. A straggler was picked up in Rhode Island in mid-December, but we may assume that the majority have already reached the tidal flats of northern Florida and Alabama, where all four of the mid-winter records were obtained. Until evidence to the contrary

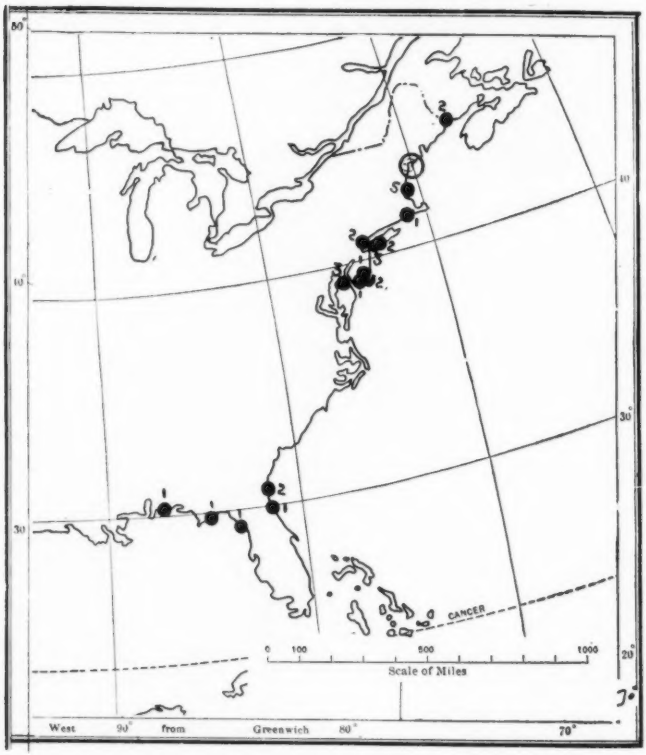


Figure 5. Map showing the distribution of recoveries from the Biddeford Pool colony. The numbers opposite the dots indicate the "year" of the recovery. The unshaded circle indicates the banding station.

is secured, it is reasonable to suppose that the center of distribution of gulls from the Biddeford Pool colony on their first winter feeding grounds lies somewhere along the northwest coast of Florida. Their migration "characteristic" is similar to that of the three colonies previously considered, but ends with the arrow-point at the most easterly location of any of them. We begin to suspect that there may be a progressive north-and-east shift of winter ranges as the breeding colonies

advance northeastward along the Atlantic Coast. More work and more data are needed for confirmation of this interesting hypothesis.

The Biddeford Pool colony has yielded an unusually high proportion of second-year recoveries. One third of the total number are in this category. In point of time, they are surprisingly well distributed. The first, at Campobello, New Brunswick, on August 31st, suggests a northward drift during the second summer. The remaining four, on October 9th, January 24th, January 24th, and March 29th, respectively, indicate a probable second-year winter range from New York to Georgia, coastwise. Considerable significance is attached to the fact that none occur on the Gulf Coast.

Of the two third-year and one fifth-year recoveries not much can be said except that the migratory instinct may still persist into the third winter. The fifth-year bird, 704544, at Beverly, Massachusetts, on May 14th, adds one more bit of evidence to the tentative hypothesis that North Atlantic Herring Gulls of breeding age normally do not occur very far south of their breeding colonies, and perhaps only accidentally south of New Jersey.

THE DUCK ISLAND (MAINE), COLONIES

Ten miles south of Northeast Harbor, Mount Desert, Maine, lie Great and Little Duck Islands exposed to the full rigors of the North Atlantic and supporting a very numerous Herring Gull population from time immemorial. Apparently, very little banding work has been done at these colonies, if we may judge from the insignificant number of recoveries obtainable from the Bureau of Biological Survey. It is particularly regrettable that we lack adequate data for constructing something more than a hypothetical migration curve. Because of the continuous history of these islands as gull rookeries, unbroken even during the ebb tide of the species at the turn of the nineteenth century, an exact knowledge of the migratory habits of these gulls might yield evidence concerning the recent ancestry of the very young colonies at Essex County and Muskeget Island.

As a matter of fact, the records of only ten recoveries have been obtained. Here is the list, arranged as previously in the order of ages:

DETAILED RECORD OF HERRING GULL RECOVERIES
FROM THE COLONIES AT GREAT AND LITTLE DUCK ISLANDS, MAINE
BANDED BY O. S. PETTINGILL AND OTHERS

Date of Banding	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gull Recovered*	*Distance from Banding Station*
7/16/29	A622864	Pork Island, Margate, N. J.	9/28/29	FD	1st year	450-S
7/27/29	A608043	Fairfield Beach, Conn.	9/28/29	FD	" "	325-S
"	A608060	Westport, Mass.	10/20/29	FD	" "	275-S
7/17/29	A622891	Beaufort, N. C.	11/ 1/29	FD	" "	850-S
7/19/30	A673592	Lake Gibson, Polk Co., Fla.	12/24/30	K	" "	1400-S
7/17/30	A515983	Port Jefferson, L. I., N. Y.	4/ 2/31	FD(Skel.)	" "	350-S
"	A673562	Galveston, Texas	4/25/31	FD	" "	2050-S
7/ 7/29	A622928	Fishers Island, N. Y.	6/ 8/30	K	" "	300-S
7/10/28	A622988	Bullocks Point, R. I.	12/14/29	FD	2d "	250-S
7/19/15	ABBA25386	Cape Porpoise, Conn.	8/ /20	...	5th "	300-S

Except for A673562, a first-year recovery at Galveston, Texas, on April 25th, the list, such as it is, strikingly resembles the Biddeford Pool tabulation. If we reject the Galveston record as an erratic without particular significance (and there is some justification on statistical grounds for doing so), we are led to wonder whence the young Essex County and Muskeget colonies derived their instinct to winter on the Gulf coast of Texas. Apparently no other known colonies on the New England coast or in the Maritime Provinces behave thus; and yet these two colonies are emigrants from an old fatherland somewhere. If we should take the hint offered by A673562 and interpolate a series of first-year Texas recoveries from December through March in the foregoing list, the migration curve would become indistinguishable from that of the Essex County colony. Immediately we should be tempted to conclude that the latter was an overflow from the Duck Islands. If, on the contrary, subsequent banding proves that the first-year winter range of the Duck Island gulls centers on the Carolina-Florida coast, it would seem likely that the hardy northern-bred gulls are less exacting in their choice of suitable winter resorts.

At this point the author files a plea that systematic banding work be done at this colony for at least five years, and that the Bureau at Washington be privately subsidized to carry out its necessary part in the program when called upon to do so.

THE GRAND MANAN COLONY

This colony embraces rookeries on several small islands off the large island of Grand Manan, New Brunswick, near the international boundary. Records of ten recoveries have been received from banding work done by Dr. C. W. Townsend and Mr. E. A. Joy a decade ago. For the sake of completeness the following tabulation is printed:

Date of Banding	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gull Recovered*	*Distance from Banding Station*
8/16/21	100646	Maces Bay, Charlotte Co., N. B.	10/18/21	I	1st year	30-N
"	100633	Jamaica Bay, L. I., N. Y.	1/ 4/22	I	" "	450-S
"	100700	Rockaway Pt., L. I., N. Y.	1/18/22	I	" "	450-S
"	100698	San Antonio Bay, Tex.	4/ 9/22	I	" "	2350-S
8/24/23	228976	Quogue, L. I., N. Y.	7/ 7/26	FD	4th "	425-S
7/14/24	312271	Cape Sable Island, N. S.	8/ /27	FD	" "	110-S
8/18/21	100696	Grand Manan, N. B.	9/10/24	FD	" "	Banding Sta.
"	100612	West Quoddy Head, Me.	Spring/26	FD	5th "	10-N
9/ 5/23	236619	Freeport, Digby Co., N. S.	9/22/30	C	8th "	40-SE
8/18/21	?	Lubec, Me.	10/—/28	?	" "	20-NW

At first sight it would appear that first-year gulls showed a tendency to remain throughout the winter along the northern coasts. The mid-October recovery at Maces Bay, New Brunswick, and the two January recoveries on Long Island, New York, are suggestive. It will be noticed that all three of these birds were found injured. Hence they may have been laggards that were forced to remain behind. Therefore the dates are without significance. The recovery of 100698 at San Antonio Bay, Texas, on April 9th proves that at least one bird reached the southwestern Gulf Coast. Much more data must be secured before we are in a position to discuss the migration curve of this colony. As a reasonable guess, we may assume that it will prove to be very similar to the Duck Island, Maine, colony, and that it is to be identified with the New England group of colonies to which belong all colonies thus far discussed.

It will be noticed that six out of the ten recoveries were adult birds in the fourth or later years, none of which were found farther south than Long Island. Five of the six adults were recovered within about one hundred miles of the rookery and one (100696) at the banding station itself on September 10th. It would be exceedingly interesting to know whether this gull had nested at its birthplace.

THE BONAVENTURE ISLAND COLONY

Mr. W. M. Duval has banded a few Herring Gulls at Bonaventure Island, Gaspé Co., Quebec, and has reported five recoveries:

Date of Banding	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gull Recovered*	*Distance from Banding Station*
7/25/24	313763	Economy, Colchester Co., N. S.	9/14/24	FD	1st year	200-SE
7/30/23	209571	Keansburg, N. J.	10/ 3/23	FD	" "	725-S
7/28/23	209565	Lavallette Beach, N. J.	11/22/23	F	" "	760-S
"	209563	Grand Manan Island, N. B.	1/15/25	Shot (?)	2d "	250-S
7/25/24	313770	Yarmouth Port, Mass.	2/18/30	FD (?)	6th "	525-S

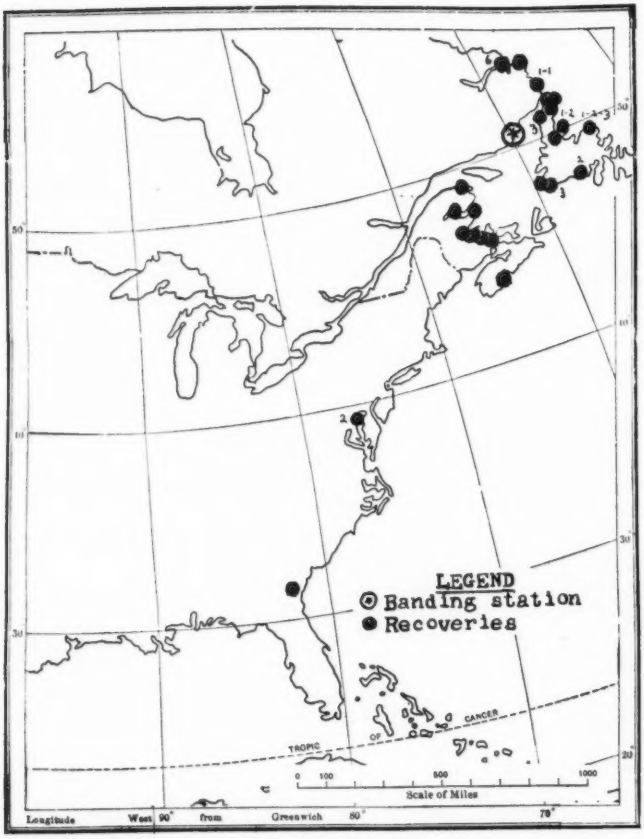


Figure 6. Map showing the distribution of recoveries from the Saginaw County, Quebec, Colonies. Numerals opposite the black dots represent the "year" or age of the recovery. Two or more numerals indicate separate recoveries from the same locality. Unnumbered black dots indicate first year gulls.

A definite southward migration of first-year immatures is indicated by the foregoing list, but the midwinter range is not yet evident. The recovery of 209565 on the coast of New Jersey in late November is inconclusive. This bird may have been a southbound straggler, ultimately destined for the Gulf Coast. The other New Jersey recovery, 209571, on October 3d, merely tends to strengthen the tentative supposition that the Bonaventure colony belongs to the same strain as the other colonies heretofore discussed.

THE SAGUENAY COUNTY, QUEBEC, COLONIES

Under this title are considered the data secured from banding work done by Dr. Harrison F. Lewis, Chief Federal Migratory Bird Officer, Ontario and Quebec, from 1923 to 1930, inclusive, at six island rookeries near the northerly shore of the Gulf of St. Lawrence about one hundred miles northeast of the easterly end of Anticosti Island. In addition, the results of banding operations in 1928 by Mr. Edmund H. Fletcher of Point Edward, Ontario, are included. Out of about 675 banded juveniles thirty-one recoveries have been reported from Washington, the latest being 657250 on October 2, 1930. The writer acknowledges with thanks the information received directly or indirectly from Dr. Lewis.

The distribution of the recoveries is shown on the accompanying map (page 14, Figure 6). With but two exceptions, every gull from this group has been recovered in the general region of the Gulf of St. Lawrence. This distribution is in striking contrast with that of the New England colonies, as for instance the Essex County colonies (see page 171, 1933, Figure 1) or the Isles of Shoals colony (see page 3, Figure 3). Judging from the map alone, we are led to infer that the Saguenay County colonies possess migratory traits conspicuously different from those heretofore discussed, despite the evidence of the two exceptions, one being a first-year bird, A701526, at Jesup, Georgia, on March 8th, and the other a second-year bird, 657201, at Fort Howard, Maryland, on May 10th. Apparently the general rule is that the gulls scatter in every direction except the west with an apparent normal limit of range bounded by southeastern Labrador, southern Nova Scotia, and the Gaspé Peninsula.

This conclusion must be accepted as probable but not final. Although the Georgia and Maryland records may reasonably be interpreted as unusual, nevertheless an analysis of the accompanying list of recoveries discloses the fact that there

are no first-winter records later than November 12th. From mid-November to March 8th there is a total blank. Thus it appears that the only evidence we possess concerning the whereabouts of first-year gulls after mid-November consists of the Georgia recovery of March 8th. The accompanying list of recoveries, arranged in the order of ages of the gulls, plainly shows the gap in the record.

In attempting to reconstruct the probable midwinter occurrence it is well to bear in mind that a continuous migration curve based on banding records is dependent on the following chain of circumstances: first, the banded gulls must die, be killed, or be caught; second, there must be satisfactory opportunity for persons to make recoveries at all seasons, wherever the gulls may happen to be; third, the finder must be sufficiently intelligent to report the recovery to Washington, and, in case he does not send the band, to read the number correctly; fourth, the number must not be garbled by the clerks, or by the mechanical tabulator, or by the author of this paper, or by the proof-reader. Even if it could be shown that the two freak (?) records resulted from error, we would still be confronted with a lack of positive evidence about the midwinter distribution of first-year birds. This very lack constitutes negative evidence of some weight when we consider the matter of opportunity. If we assume that the first-year gulls from the Saguenay colonies migrate to the Gulf States just as the New England colonies do, then we must concede that the opportunity for midwinter recoveries is identical with the latter. If so, it then becomes a matter of luck and chance whether recoveries are referable to any particular colony. Beyond a certain point the number of midwinter recoveries would be entirely dependent on the number of birds originally banded. Taking the Essex County colony for comparison, over one thousand birds were banded and the retake was fifty-five, or five per cent, eleven of which were first-year birds recovered between December 1st and February 15th, and a total of eighteen up to the following June. From the Isles of Shoals colony are listed eighty-four (4.2 per cent) retaken from about two thousand banded birds. Twenty-seven of the first-year recoveries occurred between December 1st and February 15th, and thirty-four between December 1st and June 1st. Thus the opportunity for making midwinter recoveries was sufficiently good to permit the high minimum ratios of 1 to 5 and 1 to 3. Hence, under our assumption, the Saguenay banding of 675 yielding a retake of 31 ought to

result in at least six to eight midwinter records and at least ten records from December 1st to June 1st.

As a matter of fact, the actual midwinter records of the Saguenay first-year birds are nil, and the December 1st–June 1st records consist of a single one only. It is unlikely that mere coincidence is responsible for this striking contrast. Is it not reasonable to suppose that our assumption is contrary to fact and that the midwinter range of its first-year birds is radically different from that of the other two colonies? Judging from the very numerous recoveries all along the Atlantic and Gulf seaboard, it is obvious that the opportunity factor in that region is not conspicuously low, except perhaps along the outer beaches of Virginia, North Carolina, and Florida. Hence, we are justified in believing that, by the law of chances, the normal midwinter range of the Saguenay first-years lies elsewhere. The writer considers it *probable* that their midwinter range is substantially as indicated by the actual recoveries, *viz.* the Maritime Provinces. If that is true, it is not very surprising that there are no midwinter dates, considering the severity of the long winter and the virtual cessation of shooting and fishing during that time of the year.

DETAILED RECORD OF RECOVERIES
FROM THE SAGUENAY COUNTY, QUEBEC, COLONIES

Banding Station	*Date of Banding*	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Age of Gule Recovered*
B	7/17/26	301357	Banding Station	8/ 4/26	FD	1st year
D	7/18/25	334256	Cook's Harbor, St. Barbe District, Nfd. ...about	9/ 1/25	K	" "
D	7/26/27	422189	St. Mary's Island, Saguenay Co., Quebec	9/ /27	FD	" "
B	7/20/28	657294	Spotted Islands, Lab.	9/ 8/28	C	" "
B	"	657269	Griquet, Nfd.	9/11/28	C	" "
B	8/ 1/29	A701619	Macatney Island, Grosse Isle, Lab.	9/12/29	K	" "
B	7/17/25	309551	St. Anthony, No. Nfd.	9/16,25	K	" "
F	8/10/24	309437	Fogo, Nfd.	9/20/24	K	" "
E	8/11/24	309475	8m. North Battle Harbor, Lab.	9/21/24	C	" "
B	8/ 1/29	A701589	Near Battle Harbor, Lab.	9/23/29	K	" "
A	8/12/23	204762	Near Havre St. Pierre, Saguenay Co., Quebec	10/ /23	Trap	" "
C	7/20/25	334326	Pearl Island, Lunenburg Co., N. S.	10/ 6/25	C	" "
B	7/23/27	422129	Newcastle, N. B.	10/ 6/27	K	" "
B	7/20/28	657238	Near Rose Blanche, Nfd.	10/14/28	K	" "
B	8/ 1/29	A701558	Chlorydorme, Gaspé Co., Quebec	10/21/29	K	" "
B	7/31/29	A701502	Kouchibouguac, Kent Co., N. B.	10/28/29	F	" "
B	7/20/28	660463	Pigeon Hill, N. B. ...about	11/10/28	C	" "
B	8/ 1/29	A701559	Guegen, Kent Co., N. B.	11/12/29	C	" "
B	"	A701526	Jesup, Ga.	3/ 8/30	K(?)	" "
B	"	A701583	Bay de Chaleur, No. N.B.	5/29/30	C	" "
B	7/23/27	422125	Shippigan Island, Gloucester Co., N. B.	6/ 2/28[4]	I	" "
B	8/ 2/26	418710	St. Bell Island, Raleigh, Nfd.	8/24/27	K	2d "

A	8/12/23	204694	Aspen Cove, Fogo District, Nfd.	9/19/24	K	2d year
B	7/27/27	302884	Westport, White Bay, Nfd.	9/20/28	K	" "
B	7/17/25	309553	St. Barbe District, Nfd.	10/ 2/26	K	" "
B	7/17/26	301546	Crole, Hermitage Bay, Nfd.	10/29/27	K	" "
B	7/25/28	657201	Fort Howard, Md	5/10/30	FI	" "
B	"	657250	Port aux Choix, Nfd.	10/ 2/30	K	3d "
B	8/ 3/26	418711	Trout River, St. Barbe, W. Nfd.	1/ 1/29	K	" "
B	7/17/25	309579	Codroy, Nfd.	4/27/28	K	" "
E	8/11/24	309461	Georges Cove, Lab.	8/28/29	K	6th "

Explanation of symbols designating banding station:

A—Cove Island, between Pointe au Maurier and Harrington Harbor	Lat. N. 50° 23′	Long. W. 59° 42′
B—St. Mary Islands	50° 18′	59° 38′
C—Seal Islet, near Pointe au Maurier	50° 22′	59° 48′
D—Boat Islands	50° 17′	59° 43′
E—Coacoacho	50° 12′	60° 20′
F—Fog Island	50° 10′	60° 30′

THE RED BAY, ONTARIO, COLONY

This colony is on the west side of the Bruce County peninsula between Lake Huron and Georgian Bay at about Lat. N45°45′, Long. W81° 15′. The following recoveries, all first-year birds, have been reported from banding work done by Mr. W. J. Lyon, Waukegan, Illinois, in 1929. It is regretted that further data from this interesting colony are at present unavailable.

Date of Banding	*Band No. of Recovery*	*Place of Recovery*	*Date of Recovery*	*Reference*	*Distance from Banding Station*
7/15/29	A637696	Pike Bay, Bruce Co., Ont.	8/20/29	FD	10-N
"	A637687	St. Clair Co., Mich.	9/22/29	K	150-S
"	A637560	St. Charles, Quebec (?)	9/23/29	K	430-E
"	A637682	Turkey Point, Lake Erie, Ont.	9/30/29	K	160-S
"	A637695	Montreal, Quebec	10/ 5/29	K(?)	400-E
"	A637679	New Baltimore, Mich.	10/ 5/29	FD	170-S
"	A637582	Mouth of Saginaw River, Mich.	10/19/29	K(?)	145-SW
"	A637580	Providence Bay, Ont.	11/30/29	K	70-NW
"	A637631	Stokes Bay, Ont.	12/ 1/29	C	15-N

The accompanying map on page 19, Figure 7, has been prepared to show the post-juvenile behavior of immature gulls from this colony. A definite scattering has occurred, but no southward migration is indicated. Judging by departure dates from colonies possessing the migratory trait, we may be justified in arguing that the October and November recoveries from the Red Bay colony would surely indicate any migratory tendency, should it exist. It is extremely probable that the midwinter range of first-year immatures from this colony is governed by the occurrence of open water in the lower Great Lakes' drainage system and the upper St. Lawrence River valley.

[4] Date of letter reporting the recovery.

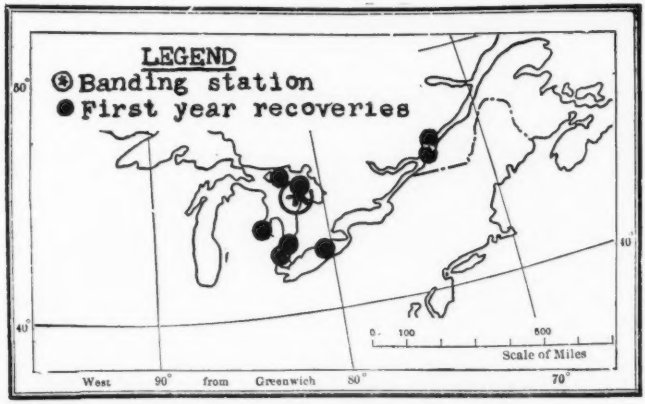


Figure 7. Map showing the distribution of recoveries from the Red Bay, Ontario, colony.

THE FOUR BROTHERS ISLAND COLONY ON LAKE CHAMPLAIN NEW YORK

Brief parenthetical mention is made of four recoveries of gulls banded at this rookery by Professor H. F. Perkins, Burlington, Vermont, on June 5, 1925.

Band No.	*Place of Recovery*	*Date of Recovery*	*Reference*	*Distance from Banding Station*
223611	Banding Station	8/ 5/25	FD	...
223628	Gulf of St. Lawrence, 30 m. from C. Gaspé	9/19/25	K	550-NE
223616	Richelieu River, St. Hilaire, Quebec	11/ 9/25	FD	50-N
223629	Montreal Island, Quebec	11/22/25	FD	40-N

It seems quite possible that this colony ultimately will prove to belong to the same group as the Saguenay and Red Bay colonies, which for convenience is termed the Laurentian populations, thus roughly indicating the midwinter range of first-year immatures.

(*To be continued*)

DISTRIBUTION AND SEASONAL MOVEMENTS OF THE HOUSE SPARROW

By JOHN T. NICHOLS

FROM January, 1930, to October, 1933, 450 House Sparrows were banded at Garden City, New York. Adult House Sparrows are notoriously trap-shy, seldom repeating or returning. Such scattering repeats and returns as there have been to date do not, in themselves, prove much as to the local movements of the species.

However, adults were banded on the right leg, and recognizably young birds on the left leg, thus dividing the population into six groups easily recognizable at the trapping station by sight. The varying proportions of these groups present by observation are shown in percentages in Table 1.

We will begin by summarizing the most obvious and best grounded conclusions based on this table:

(1) Young birds as a class leave the trapping station immediately if they are strong on the wing and independent of their parents. Their leaving seems to be due to lack of place memory, correlated with a general lack of memory which causes them to repeat much more freely than the adults. It is not that they are crowded out by the adults or seek a different environment, for at the same time the proportion of birds of the year at the station rises, as would be expected at that season. It is rather a matter of chance, with a drifting population, chance which will later bring a small proportion of them back to the station again.

(2) The proportion of banded adult males at the trapping station has risen rapidly since 1930 with continued banding, and is subject to wide seasonal fluctuations, which can only be explained by a more or less regular return of birds from outside to the station. Under the same circumstances the proportion of banded adult females has remained almost constant, with comparable seasonal fluctuations of less magnitude. The female population seems to be less mobile from month to month, but less stable from year to year.

(3) Right-banded males as compared with unbanded males may be considered old as compared with new birds at the station. The percentage of the former in the two groups taken together will give an indication of seasonal return of males (Table 3). There is a definite summer maximum percentage of right-banded males in June (1933), July (1931, 1932), or

August (1930), and a fall or winter maximum in November (1932), December (1931), or January (1930 and 1933). It is uncertain how one should interpret the fall and winter return of old birds—possibly as a different, established winter population—but returns (recaptures) of 14 different males suggest that summer and winter birds are the same individuals; and that right-banded males return to the station from late January into June, comparable to a vernal migration. It is a pure hypothesis that a good many males return and are regularly present for a short time in the fall or winter, and are irregularly absent seeking mates in spring, and back again in summer.

About equal numbers of males, females, and young were banded. At the close of April, 1932, the respective total percentages stood 37 ♂, 36 ♀, 27 juv. At the close of September, 1933, they stood 32 ♂, 33 ♀, 35 juv. This reversal of percentages is presumably caused by the decreasing proportion of unbanded adults available, owing to banding.

The first striking thing about Table 1 is the small number of birds present that were banded as young. Instead of the about 30 per cent (banded), in twenty-seven of the forty months of observation, they were below 10 per cent; in eleven months more from 10 per cent to 25 per cent; in two months only over 30 per cent of the banded birds present (see Table 2). In June, 1932, 40 young were banded, the largest number of any one group banded in any one month, yet this did not materially raise the percentage of left-banded birds in June, July, and August. Young birds as a class must, then, leave the vicinity of the station almost immediately. On the other hand, birds of the year from the outside seem to be sufficiently abundant to affect materially the proportion of unbanded female-plumaged birds. Note the peaks in that group (Table 1) of 41 and 42 in August and September, 1930; of 55, 67.50, 49, July to September, 1931; of 81 in August, 1932; of 53.50 in July, 1933. Birds from the outside later bring back with them a certain number of these left-banded individuals. Thus none that had attained male plumage was noted until January, 1932, after two years of banding, and from then on such males were present in somewhat increasing numbers.

A second point to notice in Table 1 is the seasonal increase in birds banded as adults. Peaks for right-banded males occur in August, 1930; January, July, and December, 1931; March, July, and November, 1932; January and May, 1933, reaching as high as 40 per cent of the population at the last. Right-banded females show peaks in July, 1930; January and May,

1931; February, May, and October, 1932; June, 1933, but only reach 26 per cent of the population (May, 1931), not increasing as the males do with total number of birds banded.

TABLE I

HOUSE SPARROW PERCENTAGES

July, 1930	42♂unb.	10♂rt.	..	34♀(j)unb.	14♀rt.	..	=100
Aug., 1930	37♂unb.	16♂rt.	..	41♀(j)unb.	6♀rt.	..	=100
Sept., 1930	47♂unb.	5♂rt.	..	42♀(j)unb.	5½♀rt.	½♀(j)lft.	=100
Oct., 1930	46♂unb.	8½♂rt.	..	35♀(j)unb.	10½♀rt.	..	=100
Nov., 1930	42♂unb.	14♂rt.	..	32♀unb.	11♀rt.	1♀lft.	=100
Dec., 1930	40♂unb.	17♂rt.	..	30♀unb.	13♀rt.	..	=100
Jan., 1931	32♂unb.	20⅔♂rt.	..	29♀unb.	18♀rt.	⅓♀lft.	=100
Feb., 1931	37½♂unb.	15♂rt.	..	32♀unb.	15♀rt.	½♀lft.	=100
Mar., 1931	38¼♂unb.	16½♂rt.	..	28¾♀unb.	16¼♀rt.	¼♀lft.	=100
Apr., 1931	39♂unb.	18♂rt.	..	31♀unb.	12♀rt.	..	=100
May, 1931	25♂unb.	23♂rt.	..	26♀unb.	26♀rt.	..	=100
June, 1931	17♂unb.	20½♂rt.	..	37♀(j)unb.	21♀rt.	4½(j)lft.	=100
July, 1931	13♂unb.	27♂rt.	..	55♀(j)unb.	4♀rt.	1♀(j)lft.	=100
*Aug., 1931	10♂unb.	12♂rt.	..	67½♀(j)unb.	9♀rt.	1½♀(j)lft.	=100
Sept., 1931	23½♂unb.	14½♂rt.	..	49♀(j)unb.	12♀rt.	1♀(j)lft.	=100
Oct., 1931	25♂unb.	32½♂rt.	..	26½♀(j)unb.	16♀rt.	..	=100
Nov., 1931	26♂unb.	32♂rt.	..	26♀unb.	16♀rt.	..	=100
Dec., 1931	16½♂unb.	39½♂rt.	..	29½♀unb.	13½♀rt.	1♀lft.	=100
Jan., 1932	27♂unb.	28♂rt.	1♂lft.	26♀unb.	18♀rt.	..	=100
Feb., 1932	24♂unb.	24♂rt.	2♂lft.	30½♀unb.	19♀rt.	½♀lft.	=100
Mar., 1932	21♂unb.	34♂rt.	1♂lft.	25♀unb.	18¾♀rt.	¼♀lft.	=100
Apr., 1932	25♂unb.	27♂rt.	3♂lft.	29♀unb.	15♀rt.	1♀lft.	=100
May, 1932	22♂unb.	25♂rt.	..	29♀unb.	22♀rt.	2♀lft.	=100
June, 1932	22♂unb.	32♂rt.	1♂lft.	26♀(j)unb.	15♀rt.	4♀(j)lft.	=100
July, 1932	15♂unb.	39♂rt.	1♂lft.	32♀(j)unb.	7♀rt.	6♀(j)lft.	=100
Aug., 1932	7♂unb.	3♂rt.	4(j)♂lft.	81♀(j)unb.	5♀rt.	..	=100
*Sep., 1932	16♂unb.	6½♂rt.	..	48½♀(j)unb.	10♀rt.	19♀(j)lft.	=100
Oct., 1932	25♂unb.	22♂rt.	3♂lft.	31♀(j)unb.	14♀rt.	5♀(j)lft.	=100
Nov., 1932	25♂unb.	25♂rt.	2♂lft.	35♀unb.	10♀rt.	3♀lft.	=100
Dec., 1932	38♂unb.	14½♂rt.	5½♂lft.	34♀unb.	8♀rt.	..	=100
Jan., 1933	31♂unb.	22♂rt.	½♂lft.	36½♀unb.	10♀rt.	..	=100
Feb., 1933	33♂unb.	11♂rt.	1♂lft.	40♀unb.	15♀rt.	..	=100
Mar., 1933	32♂unb.	23♂rt.	1⅓♂lft.	31½♀unb.	12♀rt.	..	=100
Apr., 1933	15♂unb.	35♂rt.	4♂lft.	32♀unb.	14♀rt.	..	=100
May, 1933	4♂unb.	41♂rt.	9♂lft.	27♀unb.	19♀rt.	..	=100
*June, 1933	..	38♂rt.	..	41♀(j)unb.	21♀rt.	..	=100
*July, 1933	10½♂unb.	23♂rt.	6♂lft.	53½♀(j)unb.	7♀rt.	..	=100
Aug., 1933	17♂unb.	20♂rt.	5♂lft.	42♀(j)unb.	11♀rt.	5♀(j)lft.	=100
Sept., 1933	18♂unb.	29♂rt.	10♂lft.	35♀(j)unb.	8♀rt.	..	=100
Oct., 1933	22♂unb.	28♂rt.	12♂lft.	30♀(j)unb.	8♀rt.	..	=100
Nov., 1933	18♂unb.	30♂rt.	10♂lft.	35♀unb.	7♀rt.[1]	..	=100

[1]This paper was read at the 1933 New York meeting of the American Ornithologists' Union, since which figures for November, 1933, have been added to the foot of this table.

From June to October, in feeding birds, females could not be differentiated from birds of the year and the figures there marked (j), are for these two groups combined.

Counts were not sufficiently high for the percentages to be satisfactory in four months marked with a (*) in the tables (August, 1931; September, 1932; June and July, 1933).

TABLE II

PERCENTAGE OF LEFT-BANDED BIRDS IN BANDED BIRDS

	Jan.	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
1930	..	..	..	..	..	..	0	0	5	0	4	0
1931	1	2	1	0	0	10	3	7*	4	0	0	2
1932	2	5	2	9	4	10	13	33	52*	18	12	20
1933	2	4	4	8	13	0*	17*	24	21	25	..	..

TABLE III

PERCENTAGE OF RIGHT-BANDED MALES IN RIGHT-BANDED AND UNBANDED MALES

	Feb.	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Jan.*	
1930	..	..	..	..	..	19	30	10	16	25	30	39	1931
1931	29	30	32	48	55	67	55*	38	57	55	71	51	1932
1932	50	62	52	53	59	72	30	29*	47	50	28	42	1933
1933	25	42	70	91	100*	71*	54	62	56	..	..	..	..

TABLE IV

A table of the number and interval of recaptures of birds banded as ♂'s, ♀'s, and juvs., shows how much more readily the juvs. repeat, and adult ♂'s return.

House Sparrow Repeats and Returns

Repeats one week or less	0♂	2♀	17 juv.	
One week to 1 month	3♂	3♀	4 juv.	4- 7-24
One month to 3 months	1♂	2♀	3 juv.	
Returns 3 months to 1 year	8♂	8♀	5 juv.	14-10-5
Over 1 year	6♂	2♀		

INTERESTING RETURNS AND RECOVERIES

Whereas, as has been said, banded adult House Sparrows are trap-shy, there is individual difference in this respect, as in other species, and two banded adult males have been in the trap several times: No. A189504, April 25 and May 25, 1930; June 19, 1931; and February 19, 1933; No. B139623, April 30, May 13, June 12, 1931; January 31 and March 7, 1932.

No. B139692, a female, and probably a bird of the year, banded August 14, 1931, was recovered six or eight miles northwest of the station June 20, 1932 (reported to the Biological Survey by Miss Ida F. Fowler), which gives some idea of the distance to which the birds move.

No. C137162, a male, banded May 1, 1933, was recovered May 30, 1933, upwards of a half-mile south of the station (Dr. H. Kimball)—direct evidence that males are not all established at their breeding places in May.

Band No. 51464, placed on a male January 26, 1930, was found in an old owl pellet (D. G. Nichols) in May, 1931.

NEST DISTRIBUTION AND SURVIVAL RATIO OF TREE SWALLOWS

By Seth H. Low[1]

The aim of the investigation of the Tree Swallow (*Iridoprocne bicolor*) this past year was to obtain data on the nesting distribution and the survival ratio. With this in mind three new substations were established and most of the old substations enlarged.[2] All the old boxes of the 1931 type were replaced by new boxes at the main Station and used at the substations. Table I lists the substations, their locations, direction, and distance from the main Station, and the type and number of boxes at each.

The program was to trap both adults in every one of the 147 nests in which eggs hatched. Birds of both sexes may be captured while building the nest, but I doubt if it would be practicable or judicious. The females when incubating are caught easily by merely walking quietly up to the boxes. Both parents feed the young and thus may be readily captured. However, it is not advisable to trap a nest until the young are three or four days old. Morever, the young after they are half grown can reach up to the hole of the box. This obviates the need for the parents to enter the box and it thereby ends trapping. Since in most of the nests the young reach this stage about the same time, the trapping period is short. I arrived on the Cape a week earlier than usual, but the trapping stage had already been reached. Unfortunately there followed a week of poor weather which not only made trapping impossible but wiped out many nests before they could be trapped.

Though I was handicapped as described, I trapped two or more adults in 88 nests; and single birds, almost all females, in 46 nests. Together, in both the nests and boxes, 230 adults were caught. Of these, 109 were returns[3] and one a recovery.

The following table (II) is based on these returns and those of previous years, and is designed to show the survival rate. The italicized figures give the number of birds banded each

[1] Contribution No. 16 from the Austin Ornithological Research Station.

[2] For status of stations in 1931 and 1932 see Notes on the Breeding of the Tree Swallow, by O. L. Austin, Jr., and S. H. Low. *Bird-Banding*, Vol. III, No. 2, April, 1932. Further Notes on the Nesting of the Tree Swallows, by Seth H. Low. *Bird-Banding*, Vol. IV, No. 2, April, 1933.

[3] A recapture at a substation although more than five miles away is considered here as a return.

TABLE I

Substations	Location	Direction and Miles from Station	Type of Box	No. of Boxes	No. of Nests	No. of Eggs	No. of Hatch	Mortality	Fledged	Efficiency Per cent
A	Pamet Point Road, Wellfleet	N 5.8	32	32	14	58+	55	28	27	..
B	Bridge Road, South Eastham	S 5.4	31	25	12	39	15	11	4	..
C	Camp Meeting Road, North Eastham	S 2	31	25	8	42	20	11	9	..
F	Near Gull Road, Wellfleet	N 5	32	10	5	25	24	3	21	..
H	Lieutenant's Island, South Wellfleet	N.W. 1	32	4	4	19+	19	5	14	..
M	Longnook, Truro	N 9.2	31	15	6	23	22	10	12	..
O	Monument Road, Orleans	S 7	31	25	6	25	10	9	1	..
P	Village, Wellfleet	N 3.9	31	10	7	26+	0	0	0	..
W	Minister's Pond, Eastham	S.E. 3				No data				
	Substations	..	..	146	62	257	165	77	88	34.3
	Main Station	..	..	387	113	553	502	292	210	38.0
	Total	..	..	533	175	810	667	369	298	36.25

year. The other figures show the number of birds known to be *alive* each succeeding year and *not* the number of returns obtained that year. Of the twenty-five young banded in 1929 at Substation C., one was captured in 1930 and two others in 1933 at the Station. Thus at least three were alive in 1930 and two in 1931–32–33.

TABLE II

	Banded as Adults					*Banded as Nestlings*				
	a	*b*	*c*	*d*	*e*		*g*	*h*	*i*	*j*
1929.....	*1*	0	0	0	0	*25*	3	2	2	2
1930.....	*2*	2	1	0		*15*	3	2	1	
1931.....	*83*	29	18			*161*	29	17		
1932.....	*90*	37				*404*	34			
1933.....	*120*					*267*				

Remembering that birds banded or recaptured in 1933 cannot return until next year, it is seen from columns a and g that there are 211 adults of which 89, or 42.2 per cent (columns b and h), were alive at the end of one year. From columns a and g it is evident that out of 92 individuals there were, according to columns c and i, 22 or 23.9 per cent alive two years afterwards. Practically the same percentage is obtained for the survival at the end of one year of birds from a single season's banding. Of 83 adults banded in 1931 there survived 29 (34.9 per cent); of 90 banded the following year, 37 (41.1 per cent). These figures, however, do not show the survival rate, for they are based on a number of birds of all ages. What these figures should show is what portion of the resident breeding population is replaced each year, either by return nestlings from the preceding year or by new birds from elsewhere. From the present figures it appears to be about 60 per cent. However, all the above figures are incomplete because the number of returns is incomplete. Only 230 of the 350 adults were captured. Of these, 109 were returns, so by the same ratio there ought to have been about 50 more returns among the 120 uncaptured birds. The returns would raise the survival percentages and reduce the replacement percentage.

An accurate indication of the survival rate must be based on returns from nestlings. As will be shown later, some of the young return to the vicinity of their birthplace and others spread into new territory. Therefore the percentage obtained for birds surviving at the end of the first year will be low. The following summary indicates, however, that after the first year the mortality rate is gradual.

Of 605 nestlings 69 were alive at the end of one year.....11.4 per cent
" 201 " 21 " " " " " " two years.....10.4 per cent

Distribution of Successive Nest-Sites

Table III summarizes the distances in feet between the successive yearly nesting-sites of Tree Swallows. On the left side is listed the number of males and females which on returning bred in a box at each of the given distances from the box each bird had bred in the previous year. The males and females have been separated to show that the matter of sex is apparently not a factor. The records of females outnumber those of males because they are more easily captured than the males. To date only seven birds have used the same box two consecutive years, and two of these were a mated pair. The cases of birds nesting within two hundred feet and possibly some of those within three hundred feet are those of birds choosing the next nearest box to their former one. Some of these are 1931 birds which returned in 1932 and chose a new-type box in preference to the old-type box which they had used previously. From the table, it is evident the birds show little attachment for a particular spot. This is not surprising, for the Tree Swallows do not feed each within a particular territory but roam together over and beyond the territory covered by the boxes, now all skimming over the marsh, in the evening dipping together over the pond, and at dusk lining a ection of telephone-wires.

TABLE III

Adults				*Nestlings*		
♀	♂	*Total*	*Distance*	♀	♂	*Total*
3	4	7	Same box	0	0	0
8	1	9	Up to 100′	0	0	0
9	5	14	100′ to 200′	2	0	2
9	2	11	200′ to 300′	1	0	1
6	1	7	300′ to 400′	1	0	1
2	0	2	400′ to 500′	2	1	3
6	0	6	500′ to 1,000′	3	0	3
4	0	4	1,000′ to 1,500′	3	2	5
2	1	3	1,500′ to 2,000′	4	2	6
8	0	8	2,000′ to 3,000′	7	0	7
0	0	0	4,000′ to 1 mile	2	2	4
0	0	0	1–2 miles	1	0	1
0	0	0	3 miles	2	3	5
0	0	0	3.9 miles	1?	0	1
0	0	0	5.4 miles	1	0	1
0	0	0	5.8 miles	2	1	3
0	0	0	7 miles	1	0	1
0	0	0	9.2 miles	1	1	2
0	0	0	11 miles	1	0	1
0	0	0	30+ miles	1	0	1

The right-hand column of Table III gives the distances between the birthplace of a bird and its breeding-site the

following year. There is a general scattering of distances running up into miles, which are cases of interchanges between stations. These interchanges will probably prove to be more numerous with the establishment and the thorough trapping of more substations. The thirty-mile record is not a first-year return. The bird, a female, was banded as a nestling on June 30, 1931, at Chiltonville, Plymouth, Massachusetts, by Clarence L. Hauthaway. The bird bred at the Station this season, but where she was in 1932 is not known. However, in view of the tendency of adults to breed in the same region successive years, it seems probable that she nested on the outer Cape in 1932. Under this assumption I have included the record in the table. The table shows a tendency of the nestlings to return to the general vicinity of their birthplace, but the small percentage of returns and the Plymouth record suggest that a greater proportion spread farther afield, beyond the present area covered by the substations.

Constancy of Mating

In 1931 the identities of 16 pairs of Tree Swallows were known and in 1932 those of 27 pairs. To prove constancy a pair must be recaptured, making a total of four captures. To prove inconstancy five captures are necessary, for each of the original pair must be retaken and the new mate of one trapped. Therefore, the chances of obtaining all the captures for a good case are infrequent. I have two cases of constancy; in one case the pair used the same box, and in the other they returned to a near-by box. Below on the left is a diagram of two similar cases of inconstancy and on the right one of a mixed case.

On the basis of these five cases no tendency towards or against constancy in mating can be established, nor are the factors which determine the subsequent relationship of a pair apparent. The box location is not a factor, for one pair used the same box and two pairs moved to other boxes. In one of the inconstant cases the male returned to the same box and the female took another box close by. In the other case all participants changed boxes.

The 1933 Season

Cape Cod experienced a cool and late spring in 1933, with numerous chilling northeast winds and many showers. The first Tree Swallows did not appear till April 3d, and throughout the entire migration there was no heavy concentration as in 1932. However, before the season was over 553 eggs were laid in 113 nests at the main Station. Last summer there were 115 nests, but two were second attempts, so the population was apparently practically the same. Table IV summarizes the past three seasons at the main Station alone. The excep-

TABLE IV

Season	*Nests*	*Lay*		*Hatch*	*Mortality*		*Fledged*		*Efficiency*
31	62	278	193	69.4%	36	18.65%	157	81.35%	56.5%
32	115	575	480	83.5%	153	31.9%	327	68.1%	58.6%
33	113	553	503	90.9%	293	58.2%	210	41.8%	38.-%

tionally high hatch, 90.9 per cent of the lay, foreshadowed a very fine season. On June 11th I inspected all of the 387 boxes at the main Station and found all the nests in perfect condition, and most of them containing young less than half grown. Late the following afternoon there occurred a very severe thunder-storm, accompanied by a deluge of hailstones as large as robin's eggs and heavy rain. A box containing six young was hit squarely by a bolt of lightning. Only a few feathers and splinters were recovered. Observations the following day showed the parents of another nest to be missing. The following morning their five young died. Whether the adults deserted or were killed by the storm is not known. During the period of June 17th–21st another complete round of the boxes showed that every nestling in 32 boxes was dead or dying and there was partial mortality in about thirty other nests. Fifty per cent of the hatch had been wiped out in a week, most of the birds being well feathered and some ready to fly.

The mortality occurred mostly between June 11th and 20th. The weather during this period is given in the following brief account based on Station notes and a recording thermograph. The temperatures are the highest reached during the day, generally for a short time in the early afternoon, and lowest reached during the night.

		Temperature	
		Highest Day	*Lowest Night*
June 12	Fair, towards evening terrific thunder storm, hail and heavy rain. Temperature 84° just before storm; dropped to 69° in two hours....	88	69

June 13	Overcast, A.M. Showers, P.M., clearing towards evening	69	60
" 14	Clear; cool east wind	70	51
" 15	A.M., fair. P.M., increasing cloudiness	69	51
" 16	Showers late in afternoon and evening	71	62
" 17	Raw; overcast; occasional drizzle	64	58
" 18	Cool; showers in P.M. Average temp. 65° except for one hour	70	56
" 19	Unsettled, clearing towards evening	66	47
" 20	Fair, easterly wind	76	47

The average high temperature for this period was 69.4° Fahrenheit, whereas for the week preceding and the rest of the month the averages were 78° and 84.4° respectively. These periods cover the time most of the nests contained young. During the period of mortality the temperature was low and there were strong winds and showers, all of which are unfavorable for a plentiful supply of insects. Under such conditions it is not surprising that 230 adults could not find food enough for themselves and their 400 young.

A summary of the nests at the main Station follows:

	No. of Nests
Eggs deserted or destroyed	6
Wiped out June 17th–21st	32
Lightning	1
Parents deserted or killed	1
Shutters to boxes closed by strings blowing	2
All died after June 23d	2
Disappeared—mammal?	1
Complete failures	45
Partially successful	54
100 per cent successful	14
	158

One point not brought out by the above table is that one or more young died in each of 81 nests. The failure of an egg to hatch accounts for some of the partial successes.

A surprising development arose in the trapping during and immediately following the period of heavy mortality. Three and even four adults were caught actually bringing food to the same brood. In each of three different boxes a female whose young had previously died was caught along with the rightful parents feeding the brood. Apparently this is a carrying-over of the maternal instinct.

A summary of the season will be found in Table I. From the point of view of birds raised it was not at all successful, for the nesting efficiency dropped from 60 per cent in 1932 to 36.8 per cent this past season.

North Eastham, Cape Cod, Massachusetts.

OBSERVATIONS OF THE NESTING HABITS OF THE BLACK AND WHITE WARBLER

By WENDELL P. SMITH

ON May 17, 1932, we noticed a female Black and White Warbler (*Mniotilta varia*) pulling off loose shreds of bark from a frost grape vine. Considerable energy was expended at times in accomplishing this, but the efforts were continued until a sufficient number of pieces were secured to constitute a "load." The work was carried on without respite during the hour in which the bird was under observation. Six trips to the nest and back were made in twenty-five minutes, and one round trip consumed only three minutes. The male, meantime, took no part in these activities but busied himself in feeding and singing, the latter being indulged in very often.

By watching the line of flight, an approximate idea of the site of the nest was obtained, and it was found after a little search. A steep bank, covered by a mixed forest growth, although deciduous trees only grew in the immediate vicinity, provided the location. This was one hundred and fifty feet distant from the source of the nesting material. A deep depression in the ground had been lined with vegetable matter of which grapevine bark formed a large proportion. A bed of dead oak leaves, left from the preceding fall, flanked the nest on the upper side and several of large proportions overhanging the structure served admirably as a roof. As the bird was first seen carrying material at noon and as the nest was completed before 4.00 P.M. of the same day, the time required for its construction is not known.

The discovery of the nest provoked the first display of interest in the work noted in the male, as he flew about scolding vigorously.

The first egg was laid on May 19th, and an egg was added on the 20th and 21st, but none was laid on the 22d. Egg-laying was resumed on May 23d, and the clutch of five was completed on the 24th. Incubation began a day earlier, on the 23d. The eggs differed greatly in size, the last two being much smaller than those laid earlier. The largest measured 21½ by 17 millimeters, while the smallest was only 17 by 13¼ millimeters. The ground color of the eggs was pale creamy white, spotted, especially about the larger end, with lavender and buffy brown, color designations being taken from Ridgway's "Color Standards and Color Nomenclature." The spots on the smaller eggs were less numerous and were chiefly lavender.

The male was not observed to take any part in incubation. Rarely he was heard singing softly near the nest. The female was a close sitter, permitting me to look into the nest on the side from a distance of three feet without moving. When flushed she fluttered rapidly over the ground with wings half dragging, uttering a note perhaps best described as between a hiss and a scream.

The female's method of approach to and departure from the nest was watched a number of times. Approach was not always from the same direction, although a tree-trunk, three and a half feet distant, frequently formed a pathway. Creeping down some trunk or branch near the nest, the bird would pause to look about several times and suddenly fly directly to the nest. In leaving she simply emerged from the leaves, flying to some tree or shrub in the immediate vicinity. During incubation the female fed near the nest, only once being seen at a distance of sixty feet and several times securing food from trees within four or five feet.

No detailed study of the activities of the female could be undertaken while incubation was in progress, but such observations as nest-leaving at 11.08 A.M. on May 30, 11.15 A.M. on the 31st, 11.28 A.M. on June 1st, 2.45 P.M. on May 31st, 2.30 P.M. on June 1st, 4.46 on May 31st, and 4.52 on June 1st may indicate some approach to a schedule. Judging from numerous disconnected observations, feeding occurred almost hourly. These absences were timed, the shortest being four minutes, the longest twenty minutes, and average eleven minutes and twenty seconds.

On June 5th two eggs hatched. The time when this occurred is not known definitely but was probably between 2.30 and 2.55 P.M. At the earlier hour the female left, and the nest was examined and the eggs were found intact. At 2.45 the female returned, and ten minutes later the male appeared with food in his bill, flew to the nest, where he remained for one minute, and left without the food. At 3.30 P.M. the female left the nest again, and during her absence the presence of the two young was discovered. The male came again with food at 4.16 P.M., and in some way the female evidently became aware of his approach, as she left, passing her mate on a near-by tree-trunk. The male remained on the nest for three minutes, and his departure, as well as his approach, was observed to be more cautious than those of his mate. The female returned at 4.30 P.M. and was still on the nest when we left at five o'clock.

A third egg hatched between the hours of 6.00 A.M. and 12.30 P.M. on June 6th. This was one of the two smaller of the clutch.

Sometime during the night of the 5th or early morning of the 6th, one of the older fledglings had disappeared from the nest. We can only speculate on the cause, but as the three eggs and the other nestling and the nest and its surroundings were undisturbed, it seems unlikely to have been a bird or mammal. Perhaps a snake was the marauder.

Only one hour could be spent in watching the schedule of activities at the nest during the next few days, and that was between 1.59 and 2.59 P.M. on June 8th. I had previously been examining the young while both parents waited with food in their bills. One minute after I withdrew, or at 2.00 P.M., both birds flew to the nest. The female remained until her mate came again with food at 2.17 P.M., when she left. The male spent two and one half minutes on the nest, leaving 30 seconds before the return of the female with food at 2.20 P.M. She brooded until 2.44, left and returned at 2.49, and was still on the nest when I discontinued my watch ten minutes later. While the male fed the young less often, he brought noticeably larger amounts of food each time.

Absence from home during the period of June 10th–14th interrupted further observations, but a late return on the latter date allowed sufficient time for banding, numbers F98877–78 being affixed. Unfortunately the young left the nest immediately, as the young of this species are apt to do when disturbed. They spent the following night in some shrubbery thirty feet away, and were seen there at 7.30 A.M. on the 15th. They were not seen again, and probably fell victims of some predator.

The male was heard singing on the 15th, 16th, and 17th, and frequently on the two latter dates. He seemed to have shifted his territory slightly, being most often seen some hundred feet eastward of the former nesting-site. No evidence of a second nest could be found, although search of the area was made several times.

To summarize my observations of this pair during the breeding season:

Only the final work of nest-building was seen, but in that the male took no part. Egg-laying did not begin until the second day after completion of the nest. Incubation seemed to be wholly the work of the female. Of five eggs only three hatched, and of the three nestlings but two survived to leave, and those two probably perished within twenty-four hours. Frequent singing by the male immediately following the failure of the first attempt to reproduce might indicate a second nesting, but no further evidence of this could be found.

Observations of the behavior of this species after nest-leaving had been made several years earlier. The nest, located in the side of a steep bank and not near stump or tree-trunk, was without any protection from the weather. The small opening at the top; its position on the hillside amid deep shadows—for it was located under coniferous trees—and the material of which it was constructed being identical with that of the forest floor, gave effective concealment. When discovered the three young were nearly ready for nest-leaving. Band numbers C1506–08 inclusive were attached, and the birds left immediately. Flight was possible only over short distances, and the wings were mainly of use in aiding the feet in progression. On June 30th they were seen on the ground near the nest and still unable to fly well. On July 1st, my notes contain only the comment that the male was singing often in the vicinity. At least two of the young were seen on July 2d, with their parents, about one hundred and fifty feet from the nest. At this time the young could fly well. On the 3d the family were located one hundred and twenty-five feet from the nest in the opposite direction, and the distance had increased to two hundred feet on the 4th. The 5th witnessed a return to the area occupied on the 2d, and there they remained during the 6th. On the 8th they were seen in the vicinity of the nest. On the 13th the family, consisting of parents and three young, were seen about two hundred feet from the nest, and the young were still being fed. Subsequent search failed to locate them. After July 3d the young kept above the ground, being seen in the smaller growth at heights varying from ten to twenty-five feet.

Some observations of the development of the 1932 brood were made, measurements being taken and changes in the color of plumage and soft parts noted. Daily while at home the young birds were compared with the color charts of Ridgway's "Color Standards and Color Nomenclature."

No. F98877, the older and larger of the two, measured 43 millimeters in length with tarsus of 7 millimeters and culmen of 5 millimeters when twenty-four hours old. F98878 had a length of 32 millimeters, culmen of 3½ and tarsus of 4 millimeters on the first day. The ninth day showed an increase in F98877 to 101 millimeters in length, or an average gain of 7½ millimeters daily, while the period of June 6th–14th (eight days) in F98878 gave an increase in length to 73 millimeters, or a daily average of 5.12 millimeters. As the period was broken, no twenty-four-hour period of greatest gain can be given with certainty. Partial records show F98877 to have made the greatest gain in length on the fourth day, an increase

of 10 millimeters. As the birds escaped before measurements were completed on June 14th, it is perhaps better not to give the fragmentary records of the growth of culmen and tarsus.

Changes in color and feather development noted were as follows: F98877 had feet pale ochraceous salmon on June 6th, pale salmon color on the 7th, pale cinnamon pink on the 8th, light Congo pink to buff pink on the 9th, and buff vinaceous on the 10th. The feet and tarsi of F98878 during the same period passed from light ochraceous salmon through light vinaceous cinnamon, light Congo pink to vinaceous fawn. The commissure of the older nestling changed from sea-shell pink on June 6th to white on the 8th, with no further change, while in the younger the change was from warm buff on June 7th through cream buff on the 8th and 9th, to ivory-yellow on the 10th. Changes in the culmen were less extensive, ranging from light drab on June 6th, to wood brown on the 7th, in the case of F98877 and a change to wood brown from a slightly lighter shade in F98878 during the same period. On June 8th, when three days old, F98877 showed follicles of the primaries beginning to break through the skin. The capital, spinal, humeral, and alar pterylæ showed as dark areas. The ventral tract at this time was slightly visible, the caudal and crural tracts were barely visible. The younger showed less development with caudal tract invisible. The eyes opened on the third day.

The most unsatisfactory feature of observations of the nesting habits of birds is usually their fragmentary character. It is also a stimulus to further observation, however, and chiefly for this reason the foregoing partial record is offered.

Wells River, Vermont, September 4, 1933.

SHOREBIRD-BANDING ON CAPE COD[1]

By MAURICE BROUN

DURING the month of August, 1933, much time and effort were spent at the Austin Ornithological Research Station in devising and perfecting improvements in the technique of trapping shorebirds. The results of this work surpassed our best anticipations, and much credit is due Mr. Seth H. Low, a member of the Station's staff, for his skill and industry.

The trapping operations were concentrated on four acres of meadowland, originally a part of a salt meadow but now separated from it by a dyke less than two hundred feet in length. The greater part of the year this spring-fed dyked meadow is flooded by rain and high-course tides. During the summer the amount of water in this meadow, teeming with insects, may be controlled to bring about a brackish, mud-flat condition, which is extremely attractive to shorebirds. The wide expanse of salt marsh, with this excellent feeding-ground, is ideally situated in the path of the migrating waders, many of which, coming down the inside reaches of the Cape, have a tendency, at this point, to swing their flight southeastwards to the extensive Nauset Marsh, a little more than three miles distant.

The type of trap employed in the capture of these birds is a modification of the clover-leaf trap described in the "Manual for Bird Banders," page 27. The three large compartments, standing about three feet high, are made of one-inch-mesh wire. Gathering cages, similar to the ordinary government sparrow-trap, are attached to two of the compartments, while from the entrances of the latter there are extended in various directions long wire leaders, about one foot in height. Adopting the principle of the fish-weir, there is a series of these traps connected more or less by the leaders. No baiting is necessary; the birds alight on the meadow and become absorbed in feeding. Sooner or later they come in contact with a leader, which is followed until presently the unsuspecting birds are entrapped. Other birds than waders taken in the dyked meadow by means of these traps, embrace several species of sparrows, blackbirds, doves, quail, robins, rails, and herons. An immature Little Blue Heron was banded on August 2, 1933.

[1] Contribution No. 15 from the Austin Ornithological Research Station.

Following is the list of fourteen species of shorebirds that were trapped and banded from August 1st to September 16th. On the latter date unusually heavy rains, flooding the entire area to a depth of one to two feet, brought about conditions favorable for attracting and trapping ducks, thus automatically ending shorebird-trapping.

	Number Banded	*Repeating Individuals*
Semipalmated Plover (*Charadrius semipalmatus*)	73	12
Ruddy Turnstone (*Arenaria interpres morinella*)	1	..
Spotted Sandpiper (*Actibis macularia*)	16	3
Eastern Solitary Sandpiper (*Tringa l. solitaria*)	5	2
Greater Yellow-legs (*Totanus melanoleucus*)	8	..
Lesser Yellow-legs (*Totanus flavipes*)	42	1
Pectoral Sandpiper (*Pisobia melanota*)	26	7
White-rumped Sandpiper (*Pisobia fuscicollis*)	25	1
Least Sandpiper (*Pisobia minutilla*)	219	13
Eastern Dowitcher (*Limnodromus g. griseus*)	8	1
Stilt Sandpiper (*Micropalama himantopus*)	13	2
Semipalmated Sandpiper (*Ereunetes pusillus*)	1895	302
Western Sandpiper (*Ereunetes mauri*)	76	7
Wilson's Phalarope (*Steganopus tricolor*)	1	..
Totals	2408	351

In the 47 days of trapping, birds were recorded 2759 times at the rate of 59.6 birds a day. These totals might have been increased but for the fact that during the last week of operations, when the shorebird migration had reached its apex, all workers were kept so busy that, for the sake of saving time, a large number of repeating Semipalmated and Least Sandpipers carrying bright new bands were released unrecorded.

The smaller sandpipers—so-called "peeps"—were trapped readily. I believe that very few peep that ventured on the meadow departed without having been banded. Larger species, however, were wary of the traps. As an illustration of this, on September 4th approximately two hundred fifty Yellow-legs of both species (Lessers predominating) were resting or feeding in the dyke meadow, usually at some distance from the traps. During the entire period of trapping only fifty Yellow-legs were captured.

One of the most interesting features of the migration was the unprecedented numbers of Stilt Sandpipers. Three or four individuals were seen daily, and as many as twelve were counted at one time.

When a Western Sandpiper was taken for the first time, on August 21st, we regarded it as something of a rarity. But several other representatives of this species appeared in rapid

succession. A decided influx occurred on September 5th, when 27 individuals were banded. In the above list, the Western Sandpiper takes third place among the species banded in large numbers. This appears to indicate that this species occurs along the Atlantic coast far more commonly than has been supposed. After a little experience with the Western Sandpipers, we were able at a glance to distinguish them from their paler-colored congeners, the Semipalmated Sandpipers. The perceptibly longer bills, and the rich chestnut markings on the heads and backs are infallible characteristics. Bill measurements taken of 68 Western Sandpipers ranged from .91 inch to 1.2 inch, with an average of 1.1 inch.

On the early evening of August 30th, a day of clear skies and gentle southwesterly winds, an adult male Wilson's Phalarope was banded. There are ten published records of previous occurrences of this species in Massachusetts.

When wholesale trapping of birds is carried on in exposed situations such as exist at our dyked meadow, a certain amount of disturbance, resulting from foraging by birds' enemies is inevitable. Snapping Turtles were responsible for some trouble, although they could not be accused of any serious depredations. On one occasion a sixteen-inch turtle was found in one of the traps. Hawks were the worst offenders. One female Marsh Hawk made periodic sallies over the meadow, hectoring the birds in the traps, and frightening the others away. Several trapped birds were found to have been decapitated by this hawk. Finally, when other expedients failed to drive away this bird, a few discharges of a shot-gun induced it to make a prolonged absence. On several occasions a Pigeon Hawk, a Cooper's Hawk, and Sharp-shinned Hawks were more or less troublesome, but none of them became serious nuisances.

North Eastham, Cape Cod, Massachusetts.

BLUEBIRD STUDIES ON CAPE COD[1]

By Seth H. Low

This article is a supplement to my preceding one on Tree Swallows.[2] All that was said there about the nesting-boxes and substations applies to the Bluebirds. Here again, much material was lost, as very few of the early nests were trapped. Most of the late and second broods were trapped, so, although I have no data on second and possible third broods, I know the identity of most of the adults breeding at the main Station.

The following table gives a complete summary of the bandings and returns of Bluebirds obtained on outer Cape Cod, Massachusetts. The few bandings and returns are not sufficient to figure any survival percentages, but two points are notable—that there are no two-year returns and that thirty-six and two-thirds per cent of the 1932 adults were recaptured in 1933 as returns. This percentage is only slightly lower than that obtained for the Tree Swallow.

TABLE I

Banded as Adults				*Banded as Nestlings*			
1930..... *2*	1	0	0	*10*	0	0	0
1931..... *9*	2	0		*19*	0	0	
1932.....*30*	11			*113*	3		
1933.....*29*				*146*			

Choice of Nest-Sites by Returns

Not only have a number of nesting-sites at the main Station been favored by Bluebirds both this and last season, but at these sites six boxes were used both seasons. However, not a single return was caught in its last season's box. The approximate distances at which the returns at the Station nested from their previous sites are as follows: 525, 570, 600, 728, 800, 900, and 3800 feet. The closest a Bluebird has come to its former site is 76 feet to an adjoining box at substation A. Only once during the two past seasons has a bird used the same box for a second brood, but at substations this has happened six times. These facts on examination prove to be consistent. The area of each substation is far smaller than that of the main Station. The number of spots favorable to Bluebirds are, therefore, proportionately fewer. These areas have fewer boxes of which a higher percentage is occupied by Tree Swallows.

[1] Contribution No. 17 from the Austin Ornithological Research Station.
[2] See article in this issue, ante, page 24.

MATING

In 1932 eight pairs of adults were banded at the Station. From two pairs neither bird returned. One adult from each of five pairs was captured nesting with a new mate. As it cannot be proved that each of the former mates were alive, it cannot be concluded that these birds were inconstant. Both adults did return from the eighth pair, but each took a new mate. No conclusions on mating constancy can be drawn from this one case.

RETURN OF NESTLINGS

Table I shows that, of 142 nestlings, 4 (2.8 per cent) returned the following year. Two of these were males from the same brood: one nested 2800 feet and the other 2200 feet from their birthplace. The third, a female, nested about 2000 feet from her birthplace. The fourth was found dead early in July over one and a half miles from where it was reared. Thus there is an apparent tendency in Bluebirds to return to the general neighborhood of their birth, but it is improbable that all of the other 138 nestlings probably had not died. Therefore, it is reasonable to suppose some have spread beyond the area covered by the substations.

PERSISTENCE OF THE FAMILY GROUP

In the late summer and fall Bluebirds are frequently taken in the grain traps and nets at the Station. They are caught generally in small groups, some of which prove to be composed of siblings. Three out of five nestlings banded July 10, 1932, were caught in two adjoining traps on September 1, 1932. All three young from another box, banded July 25, 1932, flew into the same net on October 4, 1932. In both of the preceding cases the birds were within a half-mile of where they were reared. On September 12, 1933, three out of five nestlings entered a trap within 225 feet of the box from which they had flown late in May. In addition, I have four cases of two out of four siblings appearing together a month or two after leaving the nest. Thus the young of a brood show a tendency to remain together in the vicinity of their birthplace until it is time to migrate.

To date I have not taken any of the parents with their young or the siblings of the two broods of the same parents together, but Mr. A. W. Higgins, of Rock, Massachusetts, has published[3] a record, based on repeats, sight observations, and

[3] *Bull. of the Northeastern Bird-Banding Association*, Vol. I, No. 1, pp. 2–4, Jan., 1925.

circumstantial evidence, of two adults and their two broods of young returning together to their breeding territory on September 15th after a month's absence.

THE 1933 SEASON

Table II gives a summary and comparison of the 1932 and 1933 nesting seasons. At the main Station there were 28 nests, a substantial increase over 1932. Owing to the lack of early trapping it is not known how many of these were second nestings. However, fifteen individual females were taken on nests. Nine of them were associated with one nest each. Five had second broods, and one had two successful clutches and one unsuccessful clutch. This leaves six nests unaccounted for, but they were probably the second nests of six of the nine females which were identified with only one nest apiece. Two nests containing a total of eight eggs were deserted, as against nine in 1932. Nine eggs were destroyed and twelve failed to hatch, as against one and seven in 1932. One brood of four died, and another of five was wiped out apparently by a mammal. Five other young died or disappeared from two nests.

The data on substations are incomplete. The increase in nests is due to new substations. There was a good lay of eggs but six nests containing twenty-two eggs were deserted and eleven eggs in four nests destroyed. These losses occurred chiefly at two new substations and were attributable to English Sparrows. Four eggs failed to hatch as opposed to one in 1932. There was no destruction or desertion at the substations in 1932.

TABLE II

	Nests	*Eggs*	*Hatch Per cent*	*Mortality Per cent*	*Fledged Per cent*	*Efficiency Per cent*
Main station:						
1932	20	91	83(91.2)	5(6.0)	78(94.0)	85.7
1933	28	128	99(77.3)	14(14.1)	85(85.9)	66.4
Sub-stations:						
1932	11	48	47(97.9)	5(10.6)	42(89.4)	87.5
1933	27	110	73(66.4)	4(5.5)	69(94.5)	62.7
Totals:						
1932	31	139	130(93.5)	10(7.7)	120(92.3)	86.3
1933	55	238	172(72.3)	18(10.5)	154(89.5)	64.6

The mortality and fledged percentages were practically the same both years for both the main station and the substations. The drop in efficiency is due to the loss of eggs through destruction and desertion. However, the one hundred and fifty-four nestlings raised in the boxes represents an increase of 28.3 per cent over 1932.

North Eastham, Cape Cod, Mass.

GENERAL NOTES

A New Problem for Bird-Banders.—The bird-bander is quite naturally interested in the value of his labors. The immediate results of his work are obvious; among other things he is contributing to our knowledge of the variations which exist within a species, the length of life of individuals, and of the conditions of mating. From the standpoint of general biology the work of the bird-bander is important since it adds a vast amount of detailed information on one of the major and most specialized of the vertebrate classes. In addition, bird-banding data can add to the material useful in the study of the history of races of animals as a whole. The conditions which bring about change or differentiation of a species are of utmost interest to the student of scientific natural history. It is logical to assume that if differentiation is to occur, deviates must first arise, they must mate with similar deviates, and they must transmit the deviation to their descendants. We have very little information concerning one of these steps. *Does mating occur with similar deviates?* that is, do like tend to mate with like? is there a tendency toward selective assortment at the time of mating? An impartial analysis of this factor can only be made by an exact mathematical analysis of a large body of observations.

The writer is at present engaged in this problem and is confronted with the difficulty of obtaining a large number of suitable measurements on birds. The coöperation of bird-banders would make possible the early completion of this research.

The data required must consist of uniform measurements of mated pairs. It is of the utmost importance that the observer be certain that the two birds involved are really mates. If possible, weight measurements are of value. The use of scale No. 651 made by the Central Scientific Company, 79 Amherst Street, Cambridge, Massachusetts, has been found particularly valuable. The information of coöperating members should include the date of measurement, locality, sex, and a list of the various characters studied.—C. M. Pomerat, Department of Biology, Clark University, Worcester, Massachusetts.

Starling-Banding in Central Ohio during the Winter of 1932-33.—A total of 15,402 Starlings have been banded in the Columbus region from 1927 to April 1, 1933, by the coöperative efforts of various members of the Wheaton Club. More than six thousand (6215) of these were banded during the winter of 1932–33 as follows: Dec., 1584; Jan., 702; Feb., 1895; and Mar., 2034. George Wolfram and C. Conklin banded 1460 of these during six bandings in cupolas of barns near Canal Winchester. The remainder, or 4755, were banded by the writer, assisted by two students, William Ireland and Walter Fassig, during eighteen bandings in or near Columbus. Most of these birds were captured at night in five towers at the Ohio State Hospital.

A tremendous amount of data has been obtained on migration of the Starling, general habits, winter behavior, food habits, and general physiology. Conclusions reached as a result of the early banding work of 1927 to 1930, (as compiled by Edward S. Thomas), have been further verified. Various phases of the work will be reported upon as completed.

During twelve bandings throughout the winter at the State Hospital, 5402 birds were captured, 4229 new bands were placed, 808 birds repeated (some 7 or 8 times), and 206 returns from previous bandings were obtained. The percentage of repeats ranged from 5 to 38 (average 14.9) and the percentage of returns ranged from 1.2 to 8.9 (average 3.8).

To aid in the study of the dissemination of the Starling from Columbus, it seemed desirable to band a large number of birds captured in the same evening during the height of the spring migration. Accordingly, on March 3, 1933, the writer obtained three assistants and, banding in two previously undisturbed towers at the State Hospital, succeeded in capturing 1213 birds. This would appear to be some sort of a record catch for one banding attempt, at least for Starling-banding! Needless to say, more than the usual amount of sleep was lost before the night's work was completed.

The following table summarizes the 1932–33 banding work at the State Hospital and shows the fluctuations in numbers of Starlings roosting there, as determined by careful estimates of the birds coming to the roosts and later partially checked by actual count of the birds found in the towers in which banding was done.

STARLING-BANDING, WINTER OF 1932–33, AT THE OHIO STATE HOSPITAL

Date	*Birds Present*	*Birds Handled*	*Birds Banded*	*No. of Repeats*	*Per-cent of Repeats*	*No. of Returns*	*Per-cent of Returns*	*Towers Banded in*
Dec. 3	1400	597	544	0	0.0	53	8.9	1, 3
Dec. 12	1200	453	370	46	10.2	37	8.2	1, 3
Dec. 26	1100	261	207	39	14.2	15	5.7	1, 3
Dec. 31	1000	401	368	22	5.5	11	2.7	2
Jan. 16	1000	319	235	70	21.9	14	4.4	1, 2, 3
Feb. 2	1000	631	530	73	11.5	28	4.4	1, 2, 3
Feb. 13	1000	411	302	98	23.8	11	2.8	1, 2, 2
Feb. 21	1200	256	161	86	33.6	9	3.5	1, 2, 3
Mar. 3	2400	1213	1069	70	5.8	14	1.2	4, 5
Mar. 6	1800	404	243	153	37.9	8	2.0	4, 5
Mar. 13	1700	454	300	148	32.6	6	1.3	2, 4, 5
Mar. 18	700	3	0	3	100.0	0	0.0	1, 2, 3, 4, 5
Totals		5402	4229	808	14.9	206	3.8	

The Starling is now the most abundant wintering bird in Ohio and one of the most numerous breeding species. Its rapid spread through the Mississippi Valley region has been most amazing. Because of its numbers, aggressiveness, motility, and omnivorous food-habits, the Starling deserves special attention in economic studies. Its status and possibilities for good and for evil have not yet been thoroughly evaluated in the United States. As yet we know very little compared to what may be learned by well-planned banding-studies of this species. Only 12,258 were banded in the whole country during the fiscal year 1933. This number could easily be multiplied several times. Starling-banding becomes increasingly fascinating as the study progresses and gives one the unusual opportunity of being able to follow the travels of an introduced migratory species. The value of the work would be greatly increased if a number of Starling-banders could operate in localities near a line connecting Memphis, Louisville, Cleveland, Buffalo, Montreal, and Quebec, as a large number of returns have come from those localities. The writer would be pleased to hear from other banders interested in this species.—Lawrence E. Hicks, Department of Botany, Ohio State University, Columbus, Ohio.

The Homing Instinct in the Rough-winged Swallow.—An opportunity to test the homing instinct of a nesting adult male Rough-winged Swallow (*Stelgidopteryx ruficollis serripennis*) presented itself to the writer during the past breeding season. On April 29, 1933, a pair of Rough-wings was observed inspecting a three-inch drain hole, about four feet above the ground level, in the concrete wall of a bridge spanning Munckinipattus Creek, Glenolden, Pennsylvania. On May 19th one of the pair was seen to

enter the hole and remain inside, presumably the brooding female. The nest-cavity was inspected with a flashlight June 11th, and three fledglings about three days old were discerned in the nest, which was located some three and one half feet from the entrance. On the above date the adult female was captured in the nest-hole, and banded on the *right* leg. The adult male (sex determined by larger size, slower wing-beats, and less frequent visits to feed young) was trapped and banded on the *left* leg on June 15th, and was taken by automobile in a northwesterly direction to Springfield, Pennsylvania, four miles distant, and released at 7.40 P.M. Upon the return to the banding-site at 7.55 P.M., as dusk was settling down, an adult was seen to enter the nest-hole, from which it did not emerge, and it is assumed this was the female.

The following morning, at 6.45 A.M., both adults were in evidence at the nest, and a *Sight Repeat* was secured of the male, the band on his left leg gleaming in the sunlight as he perched on a dead limb overhanging the water. Trapped again on that evening at 7 P.M., the adult male was taken seven miles away in a southerly direction and released at Upland, Pennsylvania, at 7.46 P.M. The nest was not visited by the writer until 2.20 P.M. the following day, at which time two adults were in evidence, but it was not until 3.15 P.M. that both birds were seen to enter the nest-hole, furnishing satisfactory evidence that the male had returned, and that the female had not found a new mate. The actual capture of the male at 7.30 P.M. that day verified this conclusion.

The writer, accompanied by Mr. Julian K. Potter, on the following day drove to Milford, Delaware, and *en route*, liberated the male Rough-wing at St. Georges, Delaware, at 7.10 A.M., 32.8 miles, as recorded by speedometer, due south from Glenolden, Pennsylvania. Upon our return that day at 6.48 P.M., two adult Rough-wings were observed carrying food into the nest-cavity, at which time Mr. Potter obtained a satisfactory view of the band on the left leg of the adult male.

Further investigations were frustrated the next morning upon the departure of the five fledglings from the nest, all of which were readily located and banded.

The difference in the reactions of the parent birds to the flashlight, when trapped in the nest-cavity, was very apparent. Invariably the female covered her young and refused to leave the nest for several minutes, and never until the light was turned off. On the other hand, the male always was eager to leave the premises, and would at once *hop* in bow-legged fashion toward the entrance. On several occasions, prior to the departure of the young from the nest, the two adults were observed pursuing a Sparrow Hawk (*Falco s. sparverius*), keeping up the chase until all three birds were mere specks in the sky.—JOHN A. GILLESPIE, Glenolden, Pennsylvania, November 27, 1933.

An Estimate by Means of Bands of the Number of Terns on Penikese Island, Massachusetts, in 1933.—In early July, 1933, on Penikese Island, 3266 young of Common and Roseate Terns were banded by Mr. Laurence B. Fletcher, Mr. Charles B. Floyd, Dr. Winsor M. Tyler, and others. Later, on July 19th and 20th, Mr. Francis H. Allen and the writer recovered from dead young terns some 60 bands. In one colony of Common Terns the writer examined 150 dead young terns; among these 36, or one quarter, bore bands. If one assumes that this represents the proportion of banded to unbanded young terns throughout the island, one would infer that the total number of terns hatched would be at least four times the number of birds banded, or 13,064. Assuming again that each

pair of adult terns hatched out two young, the number of adults would also be 13,064, a total of 26,128 tern population for the island.

While mortality among young terns is always great, recent storms and torrential rains were probably large factors this year and not lack of food, for small sea herrings (*Clupea harengus*) were everywhere in great abundance. I am indebted to Mr. Clinton V. MacCoy, Curator of Fishes at the Boston Society of Natural History, for the identification of the small herrings.—CHARLES W. TOWNSEND, Ipswich, Massachusetts.

Tail Plumes as a Means of Marking Individual Birds.[1]—At Ithaca, New York, several little flocks of Tree Sparrows (*Spizella a. arborea*) have established themselves year after year in the marsh and brushy fields at the head of Cayuga Lake, and there last November I set up my feeding station and started an intensive study of the local range and permanence of these little groups.

To facilitate observation I decorated the birds with brightly colored feathers. Staining the birds themselves had proved unsatisfactory in this humid Ithaca climate, and so at Dr. A. A. Allen's suggestion I used small white chicken feathers, which could be boiled in "Diamond" dye, thus

Photo by V. E. Gould

A "Plumed" Tree Sparrow.

[1]Read at the Semi-centennial Anniversary of the American Ornithologists' Union, Fifty-first Stated Meeting, in New York, November, 1933, as a portion of a paper entitled, "The Tree Sparrow in Winter and Summer."

assuring permanent colors, and glued them into the base of the tail with "Duco Household" cement (see photograph).

This method proved satisfactory in every respect. It bothered the birds not at all; with very few exceptions the feathers stuck throughout the winter; and they certainly were conspicuous. I soon discovered that by applying the feathers upside down they curled upward and were doubly noticeable. Last winter I used in general only two colors. Dr. A. C. Frazer of the Genetics Department at Cornell was operating a station at his home, where he kindly applied yellow feathers for me; at my station in the marsh the birds flaunted white plumes. For special cases different colors and combinations were used. Colors most conspicuous in the field, and less liable to fade, are brilliant red and yellow, light green, and white. Shades of blue tend to be indistinguishable from green and dirty white. With a reasonable amount of care variations can be procured by tipping the feathers with another color and thus adding to the number of possible combinations.

My conclusions are still in a more or less hypothetical condition, and I intend to go into the matter more deeply this winter, with a different color or combination for each individual. In general, however, I observed that a flock seemed to stay within a radius of from five hundred to one thousand feet. Of the thirty-odd birds that ranged in the immediate vicinity of my station I marked and caught repeatedly practically every one. Five other little flocks had their headquarters about fifteen hundred to two thousand feet in various directions from my blind, in each of which I regularly saw but one or two white feathers. These may have been stragglers from their group, or they may have been captured during the two heavy snows of the year, when I believe whole flocks wandered beyond their normal territory in search of food, for I regularly saw an unusual number of unmarked birds at my station at these times.

There were ten captures and fourteen sight records between the two stations—as the sparrow flies, about three fifths of a mile. Of these, four were regular residents at the original station, repeating frequently both before and after their capture at the other. The others never returned to the place of banding. Number '69 is unique—banded March 20, 1932, by Dr. Frazer, he repeated regularly until the end of April. The following season he was never taken there, but I caught him January 29, 1933, marking him with a red and a white feather, by means of which I secured sight repeats continuously until February 6th.

The status of these non-repeaters can only be surmised. They may have been located somewhere midway between the two stations, and wandered at random in both directions. These records may indicate a real movement during the winter (the captures were all made between January 25th and February 26th, when migration is supposedly at its lowest ebb). They may have been, like the first four, regular residents at one or the other station, with the difference simply that they did not happen to wander again into the traps. The weather does not seem to have been a factor in these wanderings, for the records are about equally divided between snowy and more open conditions.

As in any study, comparisons add materially to the value of the work. I have already had some interesting correspondence with a number of bird-banders in the Eastern States. There are doubtless other towns in which more than one station is being operated. I should appreciate hearing from such stations as to whether or not the operators ever take each others' Tree Sparrows, the distance between the stations, time of year, and conditions under which any may have been taken. Any information not already published in the various ornithological journals concerning captures from

more distant stations will also be gladly received, for, though one of the best repeaters, returning year after year to the same locality, this species is taken only rarely at other stations, and information concerning its routes of migration is almost nil.—A. MARGUERITE HEYDWEILLER, Cornell University, McGraw Hall, Ithaca, New York.

A Semipalmated Sandpiper Recovery.—A Semipalmated Sandpiper (*Ereunetes pusillus*) banded at this Station in the early evening of August 29, 1933, was "captured" twenty-six days later, September 24th, at Carupano, Venezuela, by A. A. Sentelli. If we assume that the bird took an airline flight, the journey of 2100 miles would have been accomplished at the rate of eighty miles a day. However, if we adopt the more probable belief that the bird followed the coastal route to southern Florida, and then reached Venezuela by way of the Islands of the Caribbean Sea, the bird travelled approximately 2800 miles—an average daily journey of 107.7 miles.—MAURICE BROUN, Austin Ornithological Research Station, North Eastham, Massachusetts.

A Female House Wren Recovery.—The following record of a House Wren (*Troglodytes a ædon*), C-8008, has just been completed. The bird was one of five nestlings banded on July 15, 1931 by Mr. Jerome Foxman at the Boy Scout Camp, Stambough Reservation, five miles south of Youngstown, Ohio. On the morning of October 13, 1933, this bird was found dead in a yard near a bird-bath in West Newton, Massachusetts and it had apparently died a natural death. The weather was pleasant, there had been no storms worth recording for several days, and there was at the time a migration movement of Juncos, Goldfinches, and Myrtle Warblers which were present in some numbers.

The status of this bird is problematical. It may have summered at or near the place of banding and then wandered east, or it may have summered near its place of recovery.—CHARLES B. FLOYD, Auburndale, Massachusetts

Three Returning Mated Pairs of Chickadees.—Up to the present twelve Chickadee returns[1] have appeared at my station, including three known mated pairs. Of these the history of F23150 and F23152 is most interesting. These two birds were banded within ten minutes of each other on January 29, 1932, and have kept constantly in each other's company ever since. Although I have not succeeded in tracing them to their nesting territory, their close intimacy seems to leave no reasonable doubt that they are mates. Last fall they returned together on October 8th, this year on October 14th. Their attachment is still as strong as ever, one rarely being seen without the other.

Another returning Chickadee, F23149, mated in 1932 with F23154, the pair returning together in October of that year. F23154 met with some misfortune and was not seen after October 11th. Two new birds were accompanying these birds early in the fall. F23149 mated in the spring with one of these, F31792. This pair were seen together on October 22d of this year and have repeatedly come to the feeding-shelves together since.

[1] "Return," in these notes, indicates three months absence from the station, but not necessarily from this region, since these Chickadees are all permanent residents in the locality.

The third pair to return have been seen together only once, but the visits of both individuals have been few so far as known. In this case, too, one bird, F23148, lost its mate of last year after their return in the fall and chose another, also a new bird of the year, which was banded in December, 1932.

Only two of the twelve returns were banded prior to 1932. Of these one was banded in February, 1931, and the other, A87173, was banded December 19, 1927. The latter, whose return record was given in *Bird-Banding* for January, 1933, is therefore at least six and one half years of age. Apparently age commands no respect among Chickadees for our six-year-old, who appears now to have no intimate, is repeatedly driven from the shelves by the other birds, even by the upstarts of the new generation.—Dorothy A. Baldwin, Hardwick, Massachusetts.

A Towhee Recovery.—On July 25, 1932, Towhee A239521, an immature male, was banded at our summer station at East Chop, Oak Bluffs, Massachusetts. On November 4, 1932, it was trapped by Mrs. Marie V. Beals at her station at Elmhurst, Long Island, New York, and repeated that day and each of the five succeeding days. The few instances already on record are quite inadequate to prove that certain land birds tend to migrate by land when possible, even when the route involves digression in an east-to-west direction, rather than to start on an extended overseas journey, such as that from Martha's Vineyard to Cape May, New Jersey, for instance. Nevertheless each new recorded instance of this kind tends to strengthen the theory.—Mabel Gillespie, Glenolden, Pennsylvania.

Some Unusual Barn Swallow Nesting-Sites.—While there has been no reduction in the number of barns that would cause Barn Swallows (*Hirundo erythrogaster*) to change their normal nesting-habits, as noted in the following instances, I am adding three more New Hampshire cases of their doing so, supplementing those recorded by Charles B. Floyd in *Bird-Banding* for April, 1932, page 74.

At Hampton, at the home of Mr. Thomas Caugher, for several years a pair of Barn Swallows have nested on a timber directly beneath the upper floor and over the open barn floor, where several automobiles often pass within eighteen inches of the nest day and night. For three seasons young from this nest have been banded.

At Raymond, in 1932, a pair built on the right side of the window-sill of the window to the right of the main entrance to the church, five feet above the ground. No protection was afforded the nest from three directions.

At East Westmoreland, where a barn had in 1932 apparently become quite crowded, one pair repaired to a level board nailed beneath the north eaves of the building, and reared their brood outdoors; but as all the twenty-one inside nests were not used in 1933, this nesting-site was abandoned.—Lewis O. Shelley, East Westmoreland, New Hampshire.

Three Great Blue Heron Recoveries.—On an island in the Illinois River at Depue, Illinois, I banded twenty-three Great Blue Herons (*Ardea h. herodias*) during the month of July, 1933. All the birds were young and nearly ready to leave the nest when banded. They were captured by first frightening them from their nests by making a loud noise. After they had clumsily flown to the ground, they were readily caught.

During July and August three of the birds were recovered, all in Illinois. C632806 was found dead on August 3, 1933, at LaSalle, some twenty-five

miles up the Illinois River from the place of banding. C604901 was found suffering from exhaustion on July 18, 1933, at Highland Park, some one hundred and fifty miles up the Illinois River northeast from Depue, or one hundred miles in a straight line. It was later released. C632802 was recovered at Lake Forest, five miles north of Highland Park, on August 25, 1933. The bird was reported shot because found eating goldfish. I believe these birds followed up the Illinois River to the points where they were recovered.

The Depue rookery contained fully six hundred nests.—KARL E. BARTEL, 2528 W. Collins Street, Blue Island, Illinois.

Change of Address.—The present address of Mr. A. W. Higgins is Middleboro, Massachusetts, R.F.D. Route 1, Box 356.

RECENT LITERATURE

It has been decided as an experiment to group reviews when feasible under subjects which are of importance to bird-students primarily for the purpose of suggesting problems for study by banding methods.

If one wishes to obtain an article, he may do one of three things: buy the journal containing it; ask his library to borrow it for him; or, write to the author (in care of the journal if necessary), asking for a reprint.

RETURNS AND RECOVERIES

Recovery of Marked Birds. H. F. Witherby, 1933, *British Birds*, 27, pp. 87–102. This list has one excellent feature in that the birds ringed as nestlings and those ringed as adults are clearly differentiated, something that should always be stated in any report on banded birds. The records, however, would be more useful to readers outside of Great Britain if distance and direction of the place of recovery from the place of marking were given. Also it might be pointed out that if the terminology of *Bird-Banding* were adopted, the word "Return" might be substituted for the phrase "Recovered where Ringed" and "Recovery" for "Recovered away from where Ringed."

The records give some data as to longevity: 3 Robins (*Erithacus rubecula melophilus*), 3 Blackbirds (*Turdus m. merula*), 1 Starling (*Sturnus v. vulgaris*), and 2 Lapwings (*Vanellus vanellus*) of 5 years, a Blackbird and a Chaffinch (*Fringilla c. cælebs*) of 6 years, a Turtle Dove (*Streptopelia t. turtur*) and a Curlew (*Numenius a. arquata* of 7, and a Great Black-backed Gull (*Larus marinus*) of 10 years.

As to the return of nestlings to their place of birth, 39 individuals of 7 species were found there in subsequent breeding seasons, but 10 were found at other places, in 7 cases in the same county, in 3 not. It is in such instances that the distance from the place of marking is especially important. —M. M. N.

Swedish Banding Papers. Prof. L. A. Jägerskiöld has written a number of reports on the banding work of the Biological Society of Gothenburg, this activity having been started in 1911, but discontinued from 1915–1921. The majority of the birds banded have been young; there seems to be no systematic trapping of adults. The total number banded by the end

of 1932 was 46,673 birds of 146 species; the total retaken by August 1, 1933 1641, or 3.3 per cent.

The paper in English[1] gives a good résumé of the work through 1930, although the reproduction of the maps is poor. The chief migration routes of the Black-headed Gull (*Larus ridibundus*) are discussed: the west coast of Europe is "the main route, and all the rivers" are "by-ways leading from it." The Herring Gull (*Larus argentatus*) and Great Black-backed Gull (*Larus marinus*) have yielded high returns (11.4 and 18.8 per cent by 1933 (5)); they "must be regarded as vagabonds rather than migratory birds."

A Common Tern (*Sterna hirundo*) was taken near Cape Town, Africa, eight and one half years after banding, and others were found near the marking place, "one ten years and a few days after she had been marked."

The other papers are in Swedish, a language with which the reviewer is unfamiliar, yet the main facts are not difficult to decipher. The first bulletin[2] has a large number of excellent maps showing the places of recovery of the various birds, many of them with dates.

The report of the year 1930[3] mentions a four and one half-year-old Common Heron (*Ardea cinerea*), and a five-year-old Willow Warbler, (*Phylloscopus trochilus*) ringed June 30, 1925, and recovered in France, August 6, 1930.

The next annual report[4] tells of a Spotted Flycatcher (*Muscicapa striata*) taken in Greece, August 25, of an Arctic Tern (*Sterna paradisæ*) in South Africa in December, and of a Sandwich Tern (*Sterna sandvicensis*) in Senegal, Africa, in November—all three birds captured the year they were banded.

The last paper is of particular interest[5] since it gives a summary of all banding to date, as well as the report of 1932. In the lists returns, *i.e.* captures near the place of marking after a migration, are given in black type. Of six species of Gulls 34,343 have been banded and 1303 retaken—3.8 per cent. Of six species of Terns 5946 have been banded and 47 retaken—0.8 per cent. Of 341 Common Herons 65 were taken—19 per cent; of 185 Curlews (*Numenius arquata*), 29, or 15 per cent. Of seventeen species of Hawks and Owls 398 were ringed and 51 retaken—12.8 per cent, almost the same percentage as that reported by W. F. Eaton in this journal (January, 1933, pp. 49–50) for unprotected Hawks and Owls in North America.

There are a number of noteworthy records of longevity in this last paper: Swifts (*Apus apus*) of 5 and 7 years, Herring Gulls of 5 and 6 years, Black-headed Gulls of 5, 6, and 7 years, Common Gulls (*Larus canus*) of 6, 7, and 8 years, a Sandwich Tern of 7 years, and an Arctic Tern of 11 years, this bird having been banded in Öland, July 7, 1922, and retaken there June 29, 1933.—M. M. N.

Danish Banding. More than one hundred thousand birds have been banded with Peter Skovgaard's rings, nine thousand of them in Iceland, the rest in Denmark. More than five thousand recoveries have been re-

[1] The Migrations of Some Swedish Birds. 1931. *Arch. Zool. Ital.* 16, pp. 565–576.

[2] Göteborgs Biologiska Förenings Flyttfagelmärkningar. *Göteborgs Biologiska Förening* 1904–1929, pp. 25–83.

[3] Zoologiska Avdelningen. Göteborgs Museum Arstryck, 1931, pp. 21–20.

[4] Zoologiska Avdelningen. Göteborgs Museum Arstryck, 1932, pp. 46–54.

[5] Göteborgs Naturhistoriska Museums ringmärkningar av flyttfaglar under 1932 Göteborgs Musei Arstryck, 1933, pp. 21–32.

ported. Most of the birds have been ringed when young; ducks, terns, gulls, and shorebirds figuring largely.

Mr. Skovgaard's papers,[1] all well equipped with maps, discuss the results from the geographical point of view: Danish birds recovered in the British Isles (4), France (3), Spain (1); and Icelandic birds recovered in Europe (2) and the British Isles (5), this last article being illustrated with sketches of many of the birds in question. The tables indicate by different type whether a bird was a nestling or an adult when banded, and dates of recovery more than a year after banding are given in black type.

The majority of the Danish-marked birds appear to winter in France, Portugal, and Spain. Some of the Lapwings (*Vanellus vanellus*) winter in Ireland, but others go southwest "through Belgium, France and Spain, to Morocco, and return the same way. In unusually hard winters those migrating to Ireland go farther south through Cornwall and Brittany, to join the second route" (4). As to the White Stork (*Ciconia c. ciconia*), "The migration route goes mostly southeast through Europe to Asia Minor, along River Nile to Rhodesia, Transvaal, Natal, and Cape Colony. A few go southwest through Westfalen, Belgium, France, Spain, and Cameroons, to join the same winter quarters." (4).

In comparison with the Swedish data few old birds are reported: two Common Gulls (*Larus canus*) of five years, a Lapwing of six and one half, and a Black-headed Gull (*Larus ridibundus*) of seven being the only examples in these papers of birds more than four years old, the vast majority being less than two years old.

Perhaps the most striking map is that of the migration of the European Widgeon (*Mareca penelope*) from Iceland (1), (2), (5). Most of the birds travel through Great Britain and France to Spain and Italy, but one young bird was taken in western Russia, and four were taken on the Atlantic coast from Nova Scotia to Maryland.

The author cites the case of the two migration routes of the Black Stork (*Ciconia nigra*) and states that of four birds banded in the same nest two followed the southeast route and two the southwest. Young birds of some species spread out in all directions in the fall, gradually attaching themselves to old birds that know the migration route. The author suggests that in some birds the migration routes are inherited, while in others they are not (2).—M. M. N.

Ringed Birds taken in Bulgaria.—Thirty-three birds ringed in other countries have been taken in Bulgaria,[6] among them fifteen White Storks, seven ducks, and six Black-headed Gulls. A map shows the localities of banding and recovery. Seven Storks (five from Denmark) came from the northwest, many birds from directly north, and four from the northeast—two Black-headed Gulls from Central Russia and two Pintails (*Dafila acuta*)

[1] Sobre las Emigraciones de las Aves. 1930. Conferencias y reseñas Científicas de la Real Sociedad Española de Historia Natural, 5, nos. 3–4, 125–134.

[2] Zug der Islaendischen Vögel und anschliessende Bemerkungen über den Vogelzug in Europa. 1931. Proc. VIIth Int. Ornith. Congress at Amsterdam, 1930; 392–405.

[3] La France et le Passage des Migrateurs Danois. 1931. *Alauda*, Série II, no. 4; 1–18.

[4] Birds Ringed in Denmark Recovered in British Isles. 1932. *Irish Naturalists' Journal*, 4, nos. 5 & 6; 1–8.

[5] Birds Ringed in Iceland Recovered in British Isles. 1932. *The Farmers' Journal*, Belfast, Ireland. April.

[6] Pateff, Pawel 1931. Die im Ausland beringten und in Bulgarien erbeuteten Zugvögel. Mitt. Königl. Naturwissenschaftlichen Inst. in Sofia, 4; 115–120.

from the Caspian Sea. One of the Storks was seven years old, another fourteen years old.—M. M. N.

LONGEVITY

Ages of House Finches Trapped During February, 1933, at Pasadena, California. H. and J. R. Michener, 1933, *The Condor*, 35, pp. 183–185. A very interesting analysis of the ages of a population of *Carpodacus mexicanus frontalis*. One hundred twenty six captured in February, 1933, had been previously banded as immatures: of these 40.5 per cent were ½ year old, 31.7 per cent 1½ years ld, 11.9 per cent 2½ years old, 8 per cent 3½ years old, 5.5 per cent 4 ½,1.6 per cent 5½, and 0.8 per cent 6½ yers old. Thus of these birds just before the breeding season, 40 per cent were first-year birds, and 60 per cent older. Two birds had been banded as adults eight years before. This paper merits careful study for data not only on age, but sex ratio and differential mortality of immature and adult birds.

Other recent records of long-lived individuals are an eight-year-old Western Mockingbird (*Mimus polyglottos leucopterus*), (*H. Michener*, 1933, *News from the Bird-Banders*, No. 8, p. 8), a seven and one half-year-old Gambel's Sparrow (*Zonotrichia leucophrys gambeli*) (Allen, *ibid*, p. 25), an eight and one half-year-old Gambel's Wren-tit (*Chamaea f. fasciata*) (E. L. Sumner, *ibid*, p. 21), a seven-year-old Catbird (*Dumetella carolinensis*) (L. A. and F. H. Test, *Inland Bird Banding News*, 1933, 5, No. 1, p. 3), a ten-year-old Purple Finch (*Carpodacus p. purpureus*) (M. J. McGee, *ibid*, No. 2, p. 11), and a twenty-three-year-old Parasitic Jaeger (*Stercorarius parasiticus*) (C. Oldham, 1933, *British Birds*, 27, p. 139). This last bird, a female of "rather below average size," "was tamed as a nestling in 1910 by a lad who used to feed it on his way home from school. The bird came back to Foula next spring and subsequently. When the lad was killed in the war, his friends continued to feed it for his sake. It returned as usual this year [1929]" and "came daily to be fed at the door" of a house on the Isle of Foula.

(For other items on Longevity see Recoveries.) Small passerines have a *potential* life-span of some fourteen to eighteen or even twenty-four years in captivity (Flower, S. S. 1925. *Proc. Zool. Soc.*, pp. 1366–1422), but the mortality rate is so high that even a four- or 5-year old bird is noteworthy, and one eight to ten is most remarkable. The mere fact of having escaped dangers for so many years is not so important as the question of the behavior of such a mature bird. Does it owe its long life in some degree to greater cautiousness? Does it weigh more than a young bird? Does he hold territory and sing as vigorously as ever? Or are her eggs any different in size or number from those of a young bird? Do birds in nature ever live to be too old to breed? Graf Zedlitz (*Jour. für. Ornith*, 1926, 74, pp. 296–308) wrote of non-breeding Hooded Crows (*Corvus. c. cornix*) in Sweden that led a kind of club life, some being young birds and some very old. The old males weighed considerably more than their breeding fellows, but this was not true of the old females.—M. M. N.

WEIGHT

A Year's Study of House Finch Weights. J. L. Partin, 1933, *The Condor*, 35, pp. 60–63. This valuable study isbased on one thousand weights of eight hundred birds in Los Angeles. There was an increase in weight in December, January, and February, but a drop back to normal in March. Males average somewhat heavier than females except during the

breeding season. Juveniles in May weighed 95 per cent as much as the adults; in June, 92.8 per cent; in September, 98 per cent. Birds weighed least in the early morning, "the average daily fluctuation for adults amounting to about 3.5 per cent."

One possible clue to this gain in weight in winter is given in E. L. Sumner, Sr.'s "Seasonal Behavior of Some Golden-Crowned Sparrows" (*The Condor*, 1933, 35, pp. 180–182). Four *Zonotrichia coronata* were kept in captivity and weighed three times daily for sixty days, "a marked correlation" being found "between the daily mean temperature and the weights of the birds. Whenever there was a sharp rise in the mean temperature, the weights of all four birds would drop sharply about twenty-four hours later; a decided fall in the mean temperature would be followed by a marked increase in the weight of all four."—M. M. N.

LIFE HISTORY

A Territory and Mating Study of Mockingbirds. Mrs. F. C. Laskey, 1933, *The Migrant* (Nashville, Tenn.) 4, pp. 29–35. A fine example of what can be done with colored bands and well directed zeal. The males of *Mimus p. polyglottos* were permanent residents in Nashville, Tennessee, holding territory in winter as well as summer, but not in August and September. Song started in late February, increased in mid-March, and reached its height near the end of March, when the birds sang with "ecstatic madness," "tossing themselves into the air." On March 28th the first female arrived, giving a "peculiar rasping" note; both males tried to entice her to their territories by "flying to limbs, running to forks, giving the *cluck-cluck* sounds," and later carrying twigs to shrubs and vines. Several females came, but left again, usually quite promptly, but one stayed a week. When a female was present, the songs of the male were "shorter, moderated in tone and tempo." April 9th and 10th the two males got mates that remained with them throughout the season, each pair raising two broods. The young of the first pair were not seen after the end of June.—M. M. N.

A Brief Study of the Courtship of the Eastern Cardinal (Richmondena cardinalis cardinalis Linnæus). J. M. Shaver and M. B. Roberts, 1933, *Jour. Tenn. Acad. Science*, 8, pp. 116–123. Cardinals are rather exceptional in that the female as well as the male has a well-developed song. In this paper the important rôle of the female's song in courtship is described; the female sings a song, and the male answers her with the same song, changing to a new song as soon as she does. "From February 20th until their nesting time—which for this pair began March 23d—both birds sang daily."

The authors point out that the study "would have been far more significant had it been possible to identify each individual bird absolutely throughout the study. At the time of the study (1924–25) the authors did not know of the banding (ringing) work of Burkett with groups of colored bands and of course this method had not yet been used in the United States, the work of Butts, and those that followed in his steps, came later."—M. M. N.

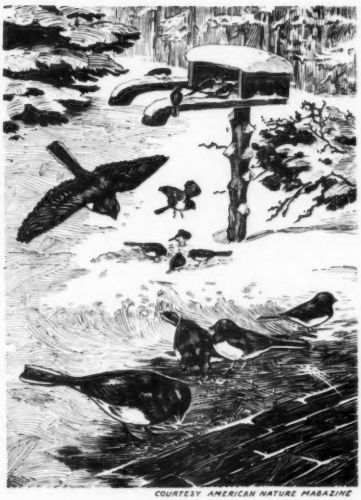
Relations Between the Sexes in Song Sparrows. M. M. Nice, 1933, *Wilson Bulletin*, 45, pp. 51–59. Mates of *Melospiza melodia beata* in Columbus, Ohio, normally remain together throughout one season, although occasionally a female deserts one mate for another—usually before nesting starts, but two did so in between broods when they had followed young into the territory of an unmated male. Five cases of remating two years in

succession have been recorded. Two cases of bigamy were observed. A few males seldom sing, yet have been as successful as the zealous singers.—M. M. N.

Migratory Behavior in Song Sparrows. M. M. Nice, 1933. *The Condor*, 35, pp. 219–227. The character of migrating or not migrating has proved stable in the majority of the breeding Song Sparrows under observation, but two summer-resident males have changed to residents and six residents (one of them a female) have changed to summer residents. Charts are given showing the inheritance of this character in twelve families for two generations, and in three families for three generations: resident sons of migratory parents were often found and once a migratory son of a resident father. The proportion of male residents has fluctuated around 50 per cent, that of the females has increased steadily from twelve to twenty-seven per cent. Other species, many of them European, are mentioned in which an analogous situation has been found. "Perhaps the migratory instinct is latent in all my Song Sparrows; it functions normally in some individuals, but for some reason lies dormant in others most of the time. It is possible that the weather at the time of the fall migration has an influence on the effectiveness of the urge in some of the birds."—M. M. N.

Wild Birds Become Tame

IF BIRDS COULD TALK



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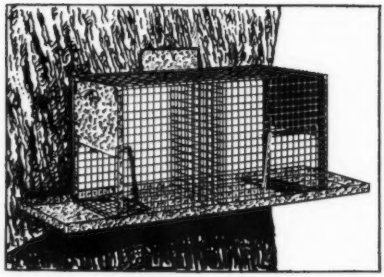

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In the United States, west of the Mississippi River—$1.50 postpaid
East of the River and in Canada—$1.75 postpaid
With wire bottom, as trap and gathering cage, add $0.25

W. B. B. A. WARBLER (Water) TRAP—TOP OPENING

Like our two-compartment trap, it is made of vertical wires, is strong, and is painted green.

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East of the River and in Canada—$3.25 postpaid

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